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ART. I.—ON LOBELINA, THE ACTIVE PRINCIPLE OF LOBELIA INFLATA, AND ON SOME OTHER PROXIMATE PRINCIPLES OF THE SEED OF THAT PLANT.

By William Procter, Jr.

In the ninth volume of this Journal (1838) was published an essay on *Lobelia inflata* by the author of this communication, which embraced a chemical analysis of the plant. According to that analysis, the following named substances were contained in the plant, viz.—*gum, gallic acid, resin and chlorophylle, fixed oil, a peculiar acrid alkaline principle, salts of lime and potassa, oxide of iron and lignin.* It was stated that the active principle of the plant was destroyed or injured by much heat, without determining the cause of the phenomenon, or exposing the peculiar circumstances under which it happened.

This active principle was described as possessing alkaline properties, as capable of forming crystalline salts with acids, and as having a brown color and semifluid consistence. The sequel will demonstrate the conditions under which this active principle is affected by heat, and the means of rendering it permanent, as well as exhibit a more detailed description of the principle itself.

In volume 5th, page 300, of this Journal, is an essay "*On*

Lobelia, the active principle of Lobelia inflata, by S. Colhoun, M. D.,* Professor of Materia Medica in Jefferson Medical College." At the period that my former essay was written, this paper by Dr. C. was cursorily examined, but the fact that his active principle was *insoluble in ether*, at once caused a belief that the principles were different, and that, that contained in my essay was unique. A subsequent and more critical examination of Dr. C.'s paper has led to the conclusion that he did not succeed in isolating lobelina, but that his principle was an impure hydrochlorate of that base, as is evident from the following extract from his paper, viz :

"The process by which this active principle was obtained, was first by dissolving it in acidulated water ; muriatic acid being used for this purpose, the menstruum continued to act on the leaves for seven hours ; it was then evaporated, the heat separating the superfluous acid.

"Crystals, on the fluid being sufficiently reduced, were discovered on the bottom of the vessel : they were mixed with some foreign earthy salt, the existence of which was proved by burning the substance remaining after the evaporation, in a small bottle kept for some hours in a red heat.

"To avoid the salts thus formed with the acid, alcohol was used as the solvent ; the extract remaining after its evaporation was beautifully transparent, and had the other properties above described. [Alluding to a previous description.] It was this extract that was principally used to form salts with the acids."

From these remarks it is evident, that the substance described as lobelina, was really a mixture of the hydrochlorate of that base, with such other matter as alcohol will extract from the watery extract of *Lobelia inflata*. Hence, this *principle* could not have had an *alkaline reaction*, and there is no mention made in the paper of its possessing this reaction. It states that "lobelia [lobelina] *forms salts* with the acids," not that it *neutralizes* acids ; and consequently we are led to believe

* An acknowledgement was due Dr. Colhoun for omitting a notice of his paper in the essay before mentioned. Since the present essay has been prepared, we lament to state that his death has occurred.

that the salts of Dr. C. were mixtures severally of the acids which gave them names, with the impure hydrochlorate of lobelina.

Speaking of the active principle, the Doctor remarks, "It is very soluble in alcohol; *scarcely, if at all, in ether:* in this respect it differs from nicotine: the active principle of *Lobelia inflata does not even color ether to which it has been added.*" This declaration is a further evidence that the active principle of Dr. Colhoun was not lobelina, *for of all the solvents of that base, none dissolve it so readily as ether:* and as Dr. C.'s principle was insoluble in that menstruum, it follows that, if lobelina, it must have been combined with an acid, in which state it is much less soluble in ether.

In a work on Materia Medica by Jonathan Pereira, professor of Materia Medica, &c. &c., at London, published in 1840. is the following under the head of *Lobelia inflata*, viz.:

"*Composition.* No accurate analysis of this plant has hitherto been made. Dr. Colhoun has announced the existence of a peculiar principle in this plant. From some experiments I have recently made on lobelia, I find that it contains *a volatile acrid principle*, (oil?) an acid, (peculiar?) resin, gum, &c. &c.

"*Vol. acrid principle.* Water distilled from lobelia has the peculiar smell and nauseous acrid taste of the plant. In one experiment I obtained a thin film, of what appeared to be a solid volatile oil. The distilled water is unaffected by acids, sesquichloride of iron, or tincture of galls."

"*An acid* (lobelic acid?) A decoction of lobelia reddens litmus, and becomes on the addition of sesquichloride of iron of a dark olive brown, and in a short time a precipitate is formed. (Lobeliate of iron.) Sulphate of copper gives rise to a green precipitate. (Lobeliate of copper.) Nitrate of silver causes a slight precipitate. (Lobeliate of silver.")

The object for which the above extracts are inserted is to notice their contents in detail.

1st. Professor Pereira states that he has obtained a *volatile acrid principle* from the *Lobelia inflata* which he infers to

be an oil. By reference to experiments 4th, 5th and 6th, of my former essay on this subject, it will be seen that this point has been fairly tested. A saturated tincture of the leaves of lobelia was distilled, and the product was found to possess the odor but *not* the acrid taste of the plant. Again—lobelia was subjected to distillation with water, and the distilled liquid returned upon a fresh portion of the plant, but the result was merely an odorous water, without any acrimony or any taste that could be said to approach it. To place this matter in a clear light, the experiments just mentioned (which were originally intended to prove the presence of a *volatile odorous principle*, but not *a volatile acrid principle*,) were repeated; lobelia was distilled and redistilled, but the results have been as above detailed; hence, the inference follows, that some accidental cause must have influenced the product of Professor Pereira.

2d. With regard to "lobelic acid" little can be learned from Professor Pereira's remarks above quoted. By referring to the first page of this article it will be seen, that the acidity of the decoction of lobelia was attributed to gallic acid. From an extended inquiry into the nature of this acid, which will be found in the sequel, it appears to be peculiar to the plant, but very like gallic acid in several of its reactions, which accounts for its having been mistaken for that acid. With these preliminary remarks, which have been made in justice to my own, and to the essays of the gentlemen respectively to whom they apply, the regular matter of this paper will be resumed.

Fixed oil. One ounce of the seed of *Lobelia inflata*, finely bruised, was macerated in two fluid ounces of sulphuric ether, 54° Baumé, for eight days with occasional agitation. The ethereal liquor was then decanted, and the seed placed on a displacement filter, and treated with ether until exhausted. This product was mixed with the first and allowed to evaporate spontaneously. Two drachms and a half of a green fixed oil was thus obtained. Besides this oil about twenty grains of a brown substance was left after the evaporation of the ether, held in solution by the alcohol contained in the ether. This substance had an extremely acrid taste, owing to its containing

a portion of the natural salt of lobelina. The green color of the oil is due to chlorophylle, derived from minute portions of the leaves of the plant being mixed with the seeds.

A portion of the seed finely bruised was subjected to pressure, surrounded by bibulous paper, and the latter, after the removal of all extraneous matter from its surface, was macerated in ether, which was subsequently evaporated. The oil thus obtained had very little color, and by exposure becomes limpid. Its specific gravity is .940°. The most prominent quality of this fixed oil is a tendency to the rapid absorption of oxygen, and hence it is one of the drying oils. So much is this the case, that a portion of oil in a shallow capsule became solid in two weeks, and when removed from the vessel had the appearance of fragments of gum arabic. A small quantity of white paint was prepared with this oil, and it was found to dry even more rapidly than linseed oil. The seeds contain about 30 per cent. of fixed oil.

Resin. When a tincture of the seeds made with alcohol 30° B., is evaporatad, a brown colored substance gradually precipitates, which, when dried, has the characters of resin.

Gum. A decoction of the seed of lobelia is precipitated abundantly by subacetate of lead, but is not affected by solution of iodine, gelatin, or ferrocyanuret of potassium.

Lobelic acid. A decoction of the leaves of lobelia is precipitated dark olive brown by sesquichloride and persulphate of iron ; green by sulphate of copper ; deep brown by nitrate of silver ; reddish brown by lime and baryta waters, and is not affected by pure soda or the chloride of calcium or barium.— From the peculiar effects of metallic salts on the decoction, Professor Pereira inferred the presence of a peculiar acid which he designated *lobelic acid*, in case future experiment should prove its claim to the title.

One ounce of lobelia leaves in powder was boiled in half a pint of water for half an hour ; when cold, the decoction was filtered, and sulphate of copper added as long as it caused a precipitate. This was collected on a filter and washed with water until the washings ceased to taste or evince an acid re-

action with litmus paper. This precipitate was suspended in water, and a current of hydrosulphuric acid was passed through the mixture, until from a green, its previous color, it had assumed a uniform deep brown hue, when it was gently heated and filtered. The brown precipitate was principally sulphuret of copper.

The filtered liquor had an acid reaction, and was evaporated carefully to dryness, yielding a dark colored extract. This was treated with boiling ether, and the ethereal solution allowed to evaporate to dryness spontaneously. A mass of a yellow color and semi-crystalline texture was obtained which instantly turned the blue color of litmus to red when applied to it in a damp state. By treating this product with cold ether and evaporating, the acid is obtained purer and in imperfect crystals. In this state, lobelic acid, when in solution, is precipitated light green by sulphate of copper; olive brown by persulphate of iron; yellow by acetate of lead; yellow by baryta water; and grayish white by nitrate of mercury. It is not precipitated by chloride of barium.

The action of heat on the active principle of Lobelia inflata.—Six ounces of lobelia seeds, in a bruised state, were macerated in twelve fluid ounces of water, acidulated with two drachms of acetic acid for three days; the infusion pressed out, saturated with magnesia and filtered. This solution had a dark greenish color and a very acrid taste. One half of it was put in a capsule on a water bath and evaporated to dryness. The extract thus obtained was *entirely without the acrimony* peculiar to lobelia, and which was so strongly manifested by the infusion previous to subjecting it to heat. The other portion of the infusion was treated with ether, and the ethereal liquor separated and permitted to evaporate. The product had a powerful acrid taste and alkaline reaction.

It was observed that the residue in the retort, after distilling water from lobelia seeds, possessed some acrimony; and consideration suggested the idea, that as the active principle was in that case combined with an acid, its presence might exert an influence in preserving the lobelina from decomposition. In

accordance with this view, the following experiment was executed :

Two drachms of bruised lobelia seeds were macerated in two ounces of water, to which five drops of sulphuric acid were added for three days, and filtered. This liquor which had a light brown color, and acrid taste, was divided into two equal portions A and B. A was put into a retort, to which a receiver was adapted, and heat applied until three-fifths of the liquid had distilled. On examination of the product and residue, the former had the odour of lobelia but was tasteless, the latter in the retort was much more acrid than the original infusion, having really *all* the acrimony of the quantity subjected to distillation.

The infusion, B, was saturated with magnesia, filtered and distilled as before, until three-fifths had passed over. The product resembled that of A. On examining the residue in the retort it was found to have *entirely lost its acrimony.*

To ascertain if lobelina itself, when freed from those substances that necessarily accompany it in an infusion, was similarly affected by heat, one and a half grains of lobelina was dissolved in an ounce and a half of water, and divided into two equal portions, No. 1 and No. 2. No. 1 was subjected to distillation in a distillatory apparatus until one-third of the liquid had passed over. The product and residue were re removed and placed in separate bottles. To No. 2 a small portion of sulphuric acid was added, rather more than sufficient to saturate the lobelina, and afterwards subjected to a similar distillatory process, and the residue and product also separately bottled. On examining the results of the distillation of No. 1, the distilled water had a lactescent appearance, which, by standing, assumed a brown color, and had a bitter taste, but not the slightest acrimony. The residue was opaque, had a brick red color, and *none* of the peculiar taste of lobelina, but merely a bitterness. The opacity of the solution No. 1, took place soon after the application of the heat to it.

The product of No. 2 was perfectly *transparent*, and had very little odor or taste. The residue was nearly transpa-

rent and more acrid than the original solution before distillation. It may be well to remark that the lobelina used in this experiment was not entirely pure, owing to the presence of some colouring matter to which the color of No. 1 residue may be attributed.

It follows from these remarks :

1st. That an acrid infusion of lobelia may be raised to the boiling temperature without losing its acrimony.

2d. That the condition necessary to bring about this permanence is the presence of an acid, with which the acrid principle will combine.

3d. That the acrid principle in a free state is decomposed by the heat of boiling water, as it is found in neither the residue or the product when a solution of it is distilled.

Lobelina. Twelve ounces of the seed of *Lobelia inflata*, finely bruised, was macerated in twenty-four fluid ounces of alcohol 28° B., acidulated with half an ounce of acetic acid for three days, and subjected to displacement. This process was continued with dilute alcohol until the seeds were exhausted of their acrimony.

The tincture, amounting to five pints, was evaporated to the consistence of an extract, which weighed an ounce and a half or one-eighth of the seeds employed. This extract was triturated with an excess of magnesia, and twelve ounces of water, gradually added. After frequent agitation for several hours, the liquid was filtered, and the filter washed with water. This solution was then agitated with six ounces of sulphuric ether until all its acrimony was removed. The ethereal solution was then decanted and allowed to evaporate spontaneously in a porcelain capsule. 18.5 grs. (.0035 per cent.) of a reddish brown matter of the consistence of honey resulted, which instantly restored the blue color of litmus, reddened by an acid, and possessed an extremely acrid, burning taste.

In this state lobelina contains coloring matter; to deprive it of which it was dissolved in water, and dilute sulphuric acid gradually added until the solution was slightly acid. It was

then mixed with purified animal charcoal, boiled, saturated with magnesia, and filtered. This solution was then agitated with ether until the lobelina was removed, and the ethereal solution separated and allowed to evaporate.

As thus obtained, lobelina has a light yellow color, and somewhat aromatic odor. It is lighter than water,* and when dropped into that fluid rises to its surface, spreads out like a drop of oil, and gradually dissolves without agitation, forming a transparent solution. If the process of purification were repeated, there is little doubt but that the lobelina would be obtained perfectly colorless.

Lobelina, in solution, is precipitated instantly as a white bitannate by tannic acid, and is not disturbed at all by gallic acid, corresponding in this particular with the other vegetable alkalies. Its solution forms a white precipitate with nitrate of silver, which becomes deep brown by standing; persulphate of iron does not at first affect the transparency of its solution, but gradually a brown precipitate falls; acetate of lead causes a white precipitate; bichloride of mercury does not produce any change.

When lobelina is placed in contact with concentrated nitric or hydrochloric acids, it is merely dissolved, without undergoing any change, and when diluted the acrimony is found unimpaired; but when acted on by sulphuric acid it is first blackened, then dissolved, and loses its acrid taste.

Lobelina is soluble in water, but not near as readily as in alcohol and ether. When its alcoholic solution is poured into water the mixture is at first cloudy, but by agitation it gradually becomes transparent. Ether readily removes lobelina from its aqueous solution. Oil of turpentine, and oil of sweet almonds, also hold it in solution when allowed to remain in contact with it for a short time.

Salts of lobelina.—A portion of lobelina was dissolved in water, and hydrochloric acid gradually added, until the solution ceased to have an alkaline reaction. The solution was

* Lobelina was formerly stated to be rather heavier than water, which was owing to the impure state in which it was obtained.

then allowed to evaporate spontaneously, and the *hydrochlorate of lobelina* obtained in four-sided prisms, terminated by pyramids.

The sulphate was obtained in a similar manner by employing sulphuric acid. It crystallizes in acicular crystals radiating from centres, but they were too small to admit of their shape being distinguished correctly.

The *nitrate* also crystallizes in prisms of irregular shape.

The *oxalate* crystallizes in minute silky needles.

The *lobeliate* of lobelina was also obtained in a crystalline form, but the difficulty of isolating the acid in a perfectly pure state prevented the salt from exhibiting perfect crystallization.

The salts of lobelina are more soluble in water than the alkaloid itself. They are also soluble in alcohol and less so in ether. They do not possess any odor, but, when tasted, exhibit all the acrimony of the base.

To ascertain if lobelina was really the *active principle*, one-fourth of a grain of that substance in solution was administered to a cat. In less than two minutes it produced violent emesis and much prostration, from which the animal fully recovered in three hours.

Again, one grain of lobelina in one fluid ounce of water was administered directly into the stomach of the animal by an elastic tube. Immediate and total prostration was the consequence, which for half an hour rendered the animal almost motionless—the pupils of the eyes were much dilated. The animal gradually recovered its strength, but the effects of the prostration were evident for fifteen hours afterwards. No emetic or cathartic effects resulted, and the long continued narcotic action of the substance may be attributed to its remaining in the stomach. Other symptoms of narcotic action were evident, which it is unnecessary to mention. From these remarks it is evident that lobelina is *not* so active an agent as nicotine.

ART. III.—ON JUNIPERUS SABINA. By Caleb H. Needles.

(*An Inaugural Essay.*)

Juniperus Sabina, U. S.—The savine plant has been made officinal in most of the Pharmacopœias, its medicinal virtues have been long known, and yet it is an article very little used.

BOTANICAL HISTORY.

The *Juniperus sabina* belongs to the class Diœcia, Order Monodelphia, L., and to the Natural Family Coniferæ of Jussieu.

SPECIFIC DESCRIPTION.

This shrub seldom rises above three feet in height. The flowers, which are male and female, grow on different plants. The male catkin consists of three opposite flowers arranged in a triple row, and a *tenth* flower at the end. At the base of each flower is a broad scale fixed laterally to a columnar pedicle. There are filaments in the terminal flower only, tapering and united at the base, with simple anthers, which are sessile in the lateral flowers. The calyx in the female flowers is 3 permanent scales; the petals are stiff, sharp, and also permanent, and the germen supports three styles with simple stigmas.—The fruit consists of a blackish purple colored berry: it is marked with tubercles which are the remains of the calyx and petals. These berries, upon examination, are found to contain three small hard seeds; they have an unpleasant smell with a hot and bitter taste.

OBSERVATIONS AND GENERAL HISTORY.

Loudon, in his Encyclopædia, gives a detail of this plant. According to his account, the word juniperus was derived from the Celtic, jenoperus, signifying rough, and rude, which

is, indeed, characteristic of the plant. The word sabina originated from the nation of Sabines, whose priests used it in their ceremonies. The different species comprize a numerous list. They are (with one or two exceptions) close, conical, evergreen shrubs or trees. In our garden, the *Juniperus sabina* seldom produces flowers or seeds. Professor Pallas says, that in the Chirsonesus Yaurica, where it is common, the savine is often found one and a half feet in diameter; that it there grows upright, similar to the cypress tree ; whereas, by the Yanais it is procumbent, the branches extending on the sand several fathoms. The wood very much resembles that of the *Juniperus lycia*, (another species,) but has a more cadaverous smell, and the leaves are more fœtid. The leaves and tops of savine have a strong, heavy, disagreeable odor, and a hot bitter taste, with a considerable degree of acrimony. These qualities depend on a volatile oil. The plant flowers in May or June.

HABITAT.

This plant is a native of the south of Europe and the Levant. It has been introduced into this country, and may be found growing in some of our gardens ; being of a hardy nature, it seems well adapted to a sandy and barren soil.

The leaves and ends of the branches are the portion used in medicine. When fresh they are of a dark green color, numerous, small, erect, pointed, glandular in the middle, and completely invest the younger branches. They are collected in the spring for medical use. As found in the shops they present a faded appearance. The *Juniperus Virginia*, or red cedar, is frequently substituted for the savine ; in appearance they resemble each other, but may be distinguished by taste and smell. It possesses properties closely analogous to those of the common pine, though much more active in its operation.

MEDICAL PROPERTIES AND USES.

Savine is highly stimulant, increasing most of the secretions.

It is more generally used in Europe than in our country, and we find instances mentioned of its efficacy in amenorrhœa; the form of administering it was that of powder, in doses of from a scruple to a drachm. It also possesses anthelmintic virtues, and is used as such by the country people in the form of a tea. It is regarded by our physicians generally as a dangerous remedy, and is now but little used ; which may, in part, be attributed to the criminal purpose to which it is applied. Dr. Woodville informs us "that its great power in opening uterine obstructions has led to uses the most infamous and unnatural." An ointment, prepared from the stems and leaves, is officinal in our Pharmacopœia, and has been found very useful as an application to blistered surfaces in order to keep up a constant discharge.

CHEMICAL HISTORY.

So far as I have been able to ascertain, no chemical analysis has been made of the plant under consideration. The works consulted for information were, for the most part, brief, and but little knowledge could be obtained as regards its history and constitution. With the hope of being able to throw some light upon the chemical constitution of *Juniperus sabina*, I have been induced to make the following experiments. The plant was collected in the fall, and used in the fresh state.

Experiment 1.—A decoction was prepared by boiling an ounce of the leaves in a pint of water for ten minutes. It was of a pale, straw color, having the peculiar odor of the plant, with a pungent acrid taste. To a portion of this decoction a small quantity of tincture of iodine was added : but there was no indication of starch being present ; a solution of subacetate of lead with another portion occasioned a flocculent precipitate of a dirty white color. The muriatic tincture of iron produced a black color with the remainder, proving the presence of tannin.

Experiment 2.—A tincture was prepared by digesting one ounce of the fresh leaves in a pint of alcohol 35° Baumé, for

seven days. At the expiration of that time, the menstruum had acquired a beautiful green hue, and possessed, in a high degree, the properties of the plant. It was filtered and a portion evaporated to the consistence of an extract which consisted of two distinct substances, of which, one was yellow, oily or unctuous, bitterish, and pungent. The other, black, resinous, slightly astringent. This was treated with sulphuric ether, which took up the coloring matter, (chlorophylle,) leaving the resinous portion undissolved. Alcohol dissolved this, and, upon a second evaporation, yielded a yellowish colored extract, excessively bitter and astringent to the taste, resinous to the touch, sticking with tenacity to the fingers. Water, when added to the tincture, gave it a milky appearance, owing to the separation of resin. Corrosive sublimate gave no indication of the presence of albumen.

Experiment 3.—An ethereal tincture was made by macerating half an ounce of the leaves in two ounces of sulphuric ether for seven days. The solution, when filtered, was clear, and of a beautiful green color. It possessed the pungent taste of the plant, with little of its odor : on evaporation it yielded a small portion of fixed oil of a light green color, having a warm, bitter taste, with the odor of the plant. The ethereal extract was of a dark yellow color, consisting of resinous, oily, and coloring matters.

Experiment 4.—One ounce of the leaves was submitted to distillation with six ounces of water. During the process the odor was increased, and the liquid in the retort acquired a dirty white color. The quantity of leaves mentioned yielded more than half a drachm of pure oil. It was nearly white, limpid, possessing a very strong odor and pungent taste; analyzed by Dumas, oil of savine was found to be a compound of 10 atoms carbon, 7.5, and 8 atoms hydrogen, 1.0.

Experiment 5.—One hundred and fifty grains of the leaves were incinerated, leaving in the crucible twenty grains of grayish colored ashes. These were lixiviated with boiling water and filtered, a small portion of nitric acid was added to the

solution, and it was then evaporated, leaving a crystalline salt possessing the properties of nitrate of potassa.

Experiment 6.—Another portion of the leaves was incinerated and lixiviated with dilute nitric acid, filtered, and the solution tested with oxalate of ammonia. This produced a copious white precipitate, indicating the presence of lime among the constituents.

Experiment 7.—An ointment of the fresh leaves was prepared according to the directions given by the Dublin College, viz.: Adeps eight ounces, Fol. Sabinæ two ounces, Cera Flav. two ounces. When finished it was of an olive color; on exposure and long standing the color becomes much lighter. A cerate made, according to the U. S. Pharm., by rubbing half an ounce of the powdered leaves with three ounces of resin cerate, presented a dark olive color, with a tinge of green.—The two different forms of preparation are essentially the same, and most probably virtually so. The red cedar is often substituted for the savine in making the ointment. The difference can be detected by appearances. To prove this, I prepared an ointment from the red cedar leaves (fresh) in precisely the same proportions as directed for making the Ungt. Sabinæ. This presented a dirty appearance, and was devoid of smell; whereas, that from savine possessed the odor of the plant in a high degree. Doctor Wood's authority may be quoted, wherein he says, "That the red cedar ointment is less efficient than the savine."

Summary.—From the foregoing experiments, I am led to believe that the following principles enter into the constitution of the leaves of the *Juniperus sabina.* To wit: First, gum; second, tannin; third, resin; fourth, chlorophylle; fifth, fixed oil; sixth, volatile oil; seventh, salts of potassa; eighth, lime and bitter extractive.

ART. IV.—CONCRETE OIL OF COCOA. By Augustine Duhamel.

In the belief that some details respecting this substance, now becoming better known, and more employed in this country, may not be uninteresting to some of the readers of this Journal, the following notice of its origin and character is submitted.

The oil or butter, so called from its well known French name *Beurre de Cacao*, is obtained from the seeds of the *Theobroma cacao*, *T. bicolor*, and other varieties, but principally from the first, which grows from twelve to twenty feet in height in South America and the West Indies.

This tree belongs to the *Polyadelphia pentandria* of Linnæus, and family of *Byttneriacèæ*. The entire fruit is in the form of a cucumber; it is divided internally into five cells, which are filled with a yellowish sub-acid pulp, in the middle of which are scattered about 30 seeds having the form of almonds, but the interior of which is brown, and divided into irregular lobes, which are separated by small white membranes. These seeds are taken out after pounding the fruit and allowing it to ferment for some time. They are afterwards dried, or previously buried in the earth, for several weeks, to deprive them of their acridity.

The chief sources from which commerce is supplied are Caraccas, Guatimala, St. Domingo, and Martinique. The first step towards the extraction from the seeds of its concrete oil, is the process of torrefaction executed in a sheet iron cylinder, the object of which is to destroy the mucilage which attaches the almond to its enevelope. When the torrefaction is complete, which is known by the discontinuance of a crackling noise, the seeds are placed so as to be acted upon by a wooden roller, which breaks the then friable thin covering.

The cocoa seeds are then separated from the husks, and reduced to powder by rubbing them forcibly over a wire sieve

having large meshes, then winnowed and passed through a mill. The next step is to reduce the whole to a paste by pounding in a heated iron mortar, to be afterwards placed in a heated water bath, with a proportion of water equal to one-tenth of the weight of cocoa employed. The heat is continued for a few minutes, and the mass then introduced into a ticking bag, and submitted to rapid pressure between two plates of tin or cast iron, previously heated in boiling water. The oil passes through the meshes of the cloth, and is collected in vessels kept ready for this purpose.

By this method a pound of cocoa is made to yield from four to six ounces of concrete oil. In this condition, however, it is not sufficiently pure, and is required to undergo purification.

To separate it from extraneous matters, it should be melted and transferred to a paper filter, placing the funnel which supports it in a stove, or heated water bath. The filtered product is then received in bottles, which should be well filled, closed, and kept in a cool place.

As thus prepared, cocoa butter is a soft unctuous solid, of white or yellowish-white color, peculiar agreeable odor and a bland pleasant taste. As brought to this country, it is often exhibited in the form of small oblong tablettes, enclosed in tin foil, but if not well preserved from the action of the air, they soon acquire rancidity, when they are no longer fit for medicinal use, as they impart an effect directly contrary to that intended.

It is often found adulterated with suet, which permits it to be sold at a low price. This fraud, to those unaccustomed to the appearance of the *Beurre de Cacao*, is difficult to recognise, and the only method so far known is to test its degree of fusibility.

Pure butter of cocoa melts at 76° F. and congeals at 60° F. When suet is added, the point of fusion varies considerably. Butter of cocoa is officinal in the French Codex. It is valued in medicine principally for its qualities as an emollient, being in great esteem as an outward application to hemorrhoidal tumours and chapped *papilæ*. It is likewise employed in the

French hospitals, internally, in certain conditions of the pulmonary and urinary organs. A few forms in which it is prescribed are subjoined.

℞—Butter of Cocoa, ℥ij.
Syrup of Tolu, } aa ℥j.
" " Capillaire, }
White Sugar, ℥ss.

To be given internally by the tablespoonful.

Suppositories.

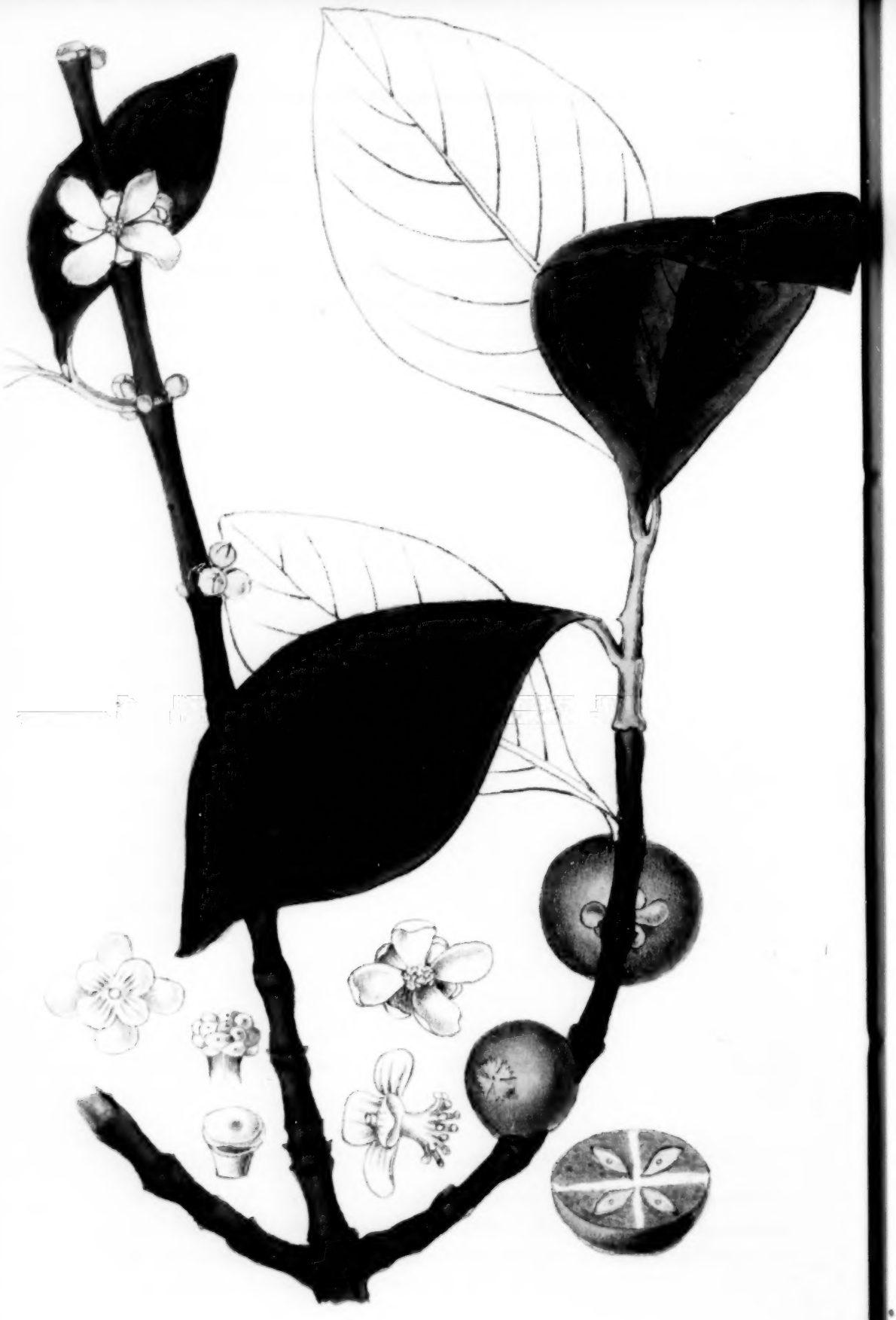
Butter of Cocoa, } aa p. e.
Veal Suet, }

Form a conical mass.

Cocoa Cerate for chapped lips and papillæ.

Butter of Cocoa, } aa ℥j.
White Wax, }
Oil of Sweet Almonds, 2 oz.

Melt together.



Hebradendron cambogioides.

On Stone by J. Pass.

P. S. Duval, Lith. Phil.ª

ART. V.—REMARKS ON THE GAMBOGE TREE OF CEYLON, AND CHARACTER OF HEBRADENDRON, A NEW GENUS OF GUTTIFERÆ, AND THAT TO WHICH THE TREE BELONGS.

By Robert Graham, M. D., Professor of Botany in the University of Edinburgh. (*With a figure.*)

There are, in tropical countries, many plants which yield a yellow juice, so nearly resembling Gamboge in external characters, and, it is said, even in medical properties, that they have each obtained in their respective countries the name of Gamboge Plant. These belong to exceedingly dissimilar families, their products are never exported from the countries in which they grow, and they are therefore known not to yield any part of the *Gamboge* of commerce. It has been much doubted, however, whether this is the produce of one plant only, and those botanists who believe that it is so, differ in opinion as to what that plant is.

Modern naturalists think this substance is obtained from a plant belonging to the natural family of *Guttiferæ;* and they generally differ only in believing, either with Murray, that this plant is *Stalagmitis cambogioides;* or, with De Candolle, that it is *Garcinia Cambogia*, (see *Essai sur les Proprietés Médicales des Plantes*, p. 105.) Murray's opinions were founded upon certain MSS. by König, and the examination of a specimen collected by him, both of which were in the possession of Sir Joseph Banks, by whose liberality he was allowed to publish his observations, which appeared in 1789, in the ninth volume of the *Commentationes Societatis Regiæ Scientiarum Göttingensis.*

The authors of the British and several of the continental pharmacopœias, have adopted Murray's opinions; but, in a paper read to the Royal Society of Edinburgh, March, 1836, I stated my belief that this acquiescence had been somewhat

too hasty ; and my belief was founded on the examination of flowering specimens and drawings, with observations made in Ceylon, most obligingly communicated to me by Mrs. Col. Walker, and on the examination of a specimen in fruit transmitted by Mr. Blair to the late Dr. Duncan, now in the Materia Medica Museum of this University.

All the *Gamboge* of *commerce* is exported, as it appears, from Singapoor, and believed to be obtained from Siam. The observations of König were made in Ceylon, and during a short stay in Siam—but chiefly at the former place, where his specimens must have been gathered; for Murray informs us that all his information in Siam was derived from a Roman Catholic priest, who gave him a very imperfect description of the tree, and that König himself had never seen it alive, and had not even an opportunity of verifying the meagre description (*descriptio proletaria*) of his informant by procuring a single twig. Out of these materials, however,—viz., the said description, the observations of König made in Ceylon, and portions of a specimen in the Banksian Herbarium, transmitted from thence by König,—does Murray construct the character of his genus *Stalagmitis*, and define his species *cambogioides*. Murray's description is, in some respects, wholly at variance with the only tree which, in Ceylon, yields a mat ter having all the properties, and answering all the purposes of *Gamboge;* yet in Ceylon, as I have said, (I presume from Murray's testimony,) König's specimens must have been obtained. Indeed, we have another authority than that of Murray for this belief; König himself gives his plant the Singhalese names of *Ghokkatu*, *Gokathu*, or *Ghotathu*, and *Kanna Ghoraka;* yet there is nothing so easy as to show that the description of *Stalagmitis* by Murray is inapplicable to this plant.*

* These observations regarding the origin of König's specimens were written before I had the direct testimony of Mr. Brown. In a letter dated Aug. 3, 1836, which I shall presently quote again, he writes, "*Stalagmitis* of Murray, as you well know, is entirely formed from König's MSS., and a portion of his specimens, or rather of one of his specimens; and these specimens, as well as the descriptions, belong to the plant of Celyon."

The specimens which I possess of the Ceylon tree and its product, and the characteristic drawings with which these are accompanied, together with the information I have obtained regarding it, I owe entirely to the great kindness of my most intelligent correspondent, Mrs. Col. Walker; who, conjointly with her husband, is profiting with equal zeal, judgment, and success, by the ample opportunities which they enjoy of cultivating an acquaintance with the botany of that rich and interesting island, Ceylon. It will give value and authority to these observations, if I make some extracts from Mrs. Walker's letters, in which the tree, in conformity with previously received opinion, is called *Stalagmitis cambogioides*,—and I shall afterwards state what the tree really is.

In her first letter, dated Colombo, 1st July, 1833, Mrs Walker says, "I have set about the *Stalagmitis cambogioides*, which is at present in fruit, and have drawn a branch, with a section of the fruit. I have likewise procured some gamboge from the tree; it is brilliant and excellent. It is obtained from two other trees here, the *Garcinia Cambogia*, and an unknown tree, which Col. Walker thinks is a *Garcinia* likewise. Specimens from both I shall send you, and drawings* also. The fruit of *G. Cambogia* is much used by the natives in their curries; and I am told, when quite ripe is a very fine fruit, as large as the *Mangosteen*, which it resembles in form. The native name is *Goraka*. The fruit of *Stalagmitis cambogioides* is much smaller, very sweet when ripe, and by no means disagreeable in flavor. It is called here *Kana* (or eatable) *Goraka*. I have not yet ascertained all the uses made here of gamboge, but it is certainly employed as a pigment by the native artists. Our servants say it is also used by native practitioners in medicine, and sometimes as a plaster, when first taken from the tree. It does not appear to exude like a gum, but on an incision being made, it issues freely

* I have received excellent drawings of *Garcinia Cambogia*, (Willd.,) of *Garcinia Cambogia*, β. (Moon,) and of the unknown plant alluded to, together with specimens of the two first, but none of the last, which seems a species of *Carallia*.—R. G.

through the pores of the bark, as I saw yesterday on cutting both the *Stalagmitis cambogioides* and *Garcinia Cambogia*. I have been trying it as a paint to-day, and find it as good as any I ever used.* We have no intercourse whatever with Siam, and I fear I can procure you no information from thence. I should think, from the specimen I have already got, that the matter which exudes from the *Stalagmitis cambogioides*, when an incision is made in the bark, is undoubtedly pure Gamboge. I have used it in coloring some of my flowers: it is quite liquid when it issues from the pores of the tree, but soon hardens when exposed to the air. I have not tried the stuff from the *Garcinias*, but it tastes and smells exactly like Gamboge."

Mrs. Walker's next letter is dated Aug. 20, 1834:—She says, "Your letter of February, 1833, in which you first mention the subject of Gamboge, I received in June of the same year, and immediately inquired about the plant, which I found to be in fruit. In that state I drew it to the best of my abilities, but put off sending it to you till I had an opportunity of forwarding also a representation of the flower, which, as many plants here blossom twice in the year, I hoped I might not have long to wait for. However, I was mistaken in this; the tree did not blossom till March, 1834. I drew it then, but have not since been able to send it home, not a single ship having sailed from hence to England during that long interval; and, I fear, after all, that you will consider my drawing incomplete, as it is the only barren flower I have had the means of representing. So at least it seems to me, and I got quantities of the blossoms, and examined a great number, and found them all the same. I shall send you specimens for your own examination; but I am sorry to say, they look very shabby and poor. The flower, however, in its best state, is insignificant, and

* In a note on the back of the drawing, Mrs. Walker says, "It issues from an incision in a thickish liquid state, and of a light yellow color, but soon hardens when exposed to the air, and becomes of a much deeper hue, and is perfectly fit for use in water-color drawings, as much so as any I ever purchased, which was prepared and sold in the London color-shops."

poor-looking. The tree does not grow abundantly nor luxuriantly in the immediate neighborhood of Colombo. Last January we took a little excursion, and got quite into a forest of *Stalagmitis cambogioides*, and perceiving all the trees had their bark cut off in various places, I concluded the people in the neighborhood must be in the habit of collecting the gum, and determined to get all the information I could on the subject, for your edification. From a very intelligent native practitioner in medicine, I gained the following :—He told us that Gamboge from the *Stalagmitis*, called by the natives *Gokatu*, or *Kana Goraka*, is generally used by them, both as a pigment and medicinally. For the former purpose it is ground very fine with lime-juice,* and mixed with a pretty strong solution of the gum of *Wood Apple (Feronia Elephantum,)* called in Singhalese, *Diwul.* With the addition of a little Chunam, or Lime, they make a deep orange-color, both tints being much used in the decoration of their temples and Boodh himself is always represented in yellow garments. Yellow is indeed the sacred color, the priests being invariably arrayed in yellow robes.

"As a medicine, the Gamboge is ground to a fine powder, and being mixed with the juice expressed from the leaves of the Tamarind Tree, is taken with a little water. This is the most common mode of administering it as an aperient; but when mixed with other ingredients it is considered by native practitioners to be beneficial in many diseases. It is collected by cutting pieces of the bark completely off, about the size of the palm of the hand, early in the morning. The Gamboge oozes out from the pores of the bark in a semi-liquid state, but soon thickens, and is scraped off by the collectors next morning without injury to the tree, the wounds in the bark readily healing and becoming fit to undergo the operation again. The learned doctor who gave us this information, presented us

* In a recent letter to Dr. Christison, Mrs. Walker says that she finds this to be a mistake. As a yellow pigment, the juice is used without any preparation; the addition of lime juice injuring the color—an observation which Dr. C. has confirmed by experiment.

with a large pot or jar of Gamboge, and promised to send us more, which promise he faithfully kept, and I shall forward specimens to you of his present by the first opportunity. The *Garcinia Cambogia*, of which I transmit you a representation, is one of the most common trees in this neighborhood, attaining a large size, and is very handsome, with remarkable thick and dark foliage. A quantity of resinous juice proceeds from its bark, in the same manner that Gamboge does from the *Stalagmitis;* but it never seems to harden thoroughly, and no use is made of it by the natives. The outer husk of the fruit, however, is a favorite ingredient in their curries. They prepare it by taking out the pulp and seeds, breaking it to pieces, and putting it in a heap, which is covered for two or three days till it becomes soft. It is then smoked by burning cocoa-nut shells below the grating on which it is spread. This operation is continued for many days, when it is tied up tight in a bag, and kept for use by being hung, I cannot say in the chimney, for chimneys they have none,—but where it is under the influence of the smoke from their fires when cooking. They also use it in pickling or preserving, along with salt, a kind of small fish, which cured in this way will keep for six or seven months. The flower of No. 2, which I suppose is also a *Garcinia*, differs much from No. 1, but the fruit appears almost the same, and is used by the natives in the same way. They are indiscriminately called Goraka by the Singhalese, but are distinguished by their color."*

In a subsequent letter, dated January 2, 1835, Mrs. Walker says, "I am convinced *Stalagmitis* produces true *Gamboge* Dr. Pitcairn is of the same opinion, and desires me to tell you that he has administered it in the same way as it is used medicinally at home, and found its effects precisely the same."

I shall now state what the plant seems to be which is called

* No. 1. I believe this to be *Garcinia Cambogia*, Willd., which is *G. affinis* of Wight and Arrnott, certainly not of Wallich. No. 2 is probably a *var.* of *G. Kydia* of Roxb., perhaps his *G. purpurea*; but as Roxb. gives no description of *G. purpurea*, the point cannot be determined. It is, no doubt, the *G. Cambogia β.*, or Red Garcinia, of Moon's Catalogue. R. G.

by Mrs. Walker *Stalagmitis cambogioides*, and what are my reasons for forming the opinion which I entertain.

Linnæus, in his *Flora Zeylanica*, No. 195, under the name *Cambogia*, quotes as a synonym, "Carcapuli Acostæ, fructu malo aureo simili," of Plukenett's *Almagestum Botanicum;* which, if it be the same as the twig figured by Plukenett in his *Phytographia, t.* 147, *fig.* 3, seems to me to be *Xanthochymus ovalifolius.*

In the same work, Linnæus also quotes, as a synonym of his Cambogia, the "Arbor Indica, quæ gummi guttam fundit, fructu acido sulcato mali magnitudine" of Commelyn's *Flora Malabarica*, which is certainly "Coddam-pulli" of Rheede in *Hortus Malabaricarus, Mangostana Cambogia* of Gærtner, *Garcinia Cambogia* of Desrousseaux and of De Candolle.

Linnæus, lastly, in the same work, cites as a synonym for his *Cambogia* "Carcapuli Acostæ, Arbor Indica gummi guttam fundens, fructu dulci, rotundo, cerasi magnitudine," of Burmann's *Thesaurus Zeylanicus*, which, I think, is certainly *Mangostana Morella* of Gærtner, *Garcinia Morella* of Desrousseaux and De Candolle, and, as certainly, *Stalagmitis cambogioides* of Moon's Catalogue of Ceylon Plants, and of Mrs. Walker; but by no means the "*Carcapuli*" of Acosta in his *Tractado de las Drogas*, p. 356; which seems to be *Carcapuli Acostæ* of *Pluk. Alm.* 81, *Garcinia Cambogia* of Desrousseaux.

It would probably be thought tedious and useless to follow the contradictions of authors regarding the identity of these plants, and that which yields Gamboge, from 1748, when the *Flora Zeylanica* was published, to the present day. I shall therefore pass them all over, until I come to the latest. In the excellent "*Prodromus Floræ Peninsulæ Indiæ Orientalis*," published by my friends, Dr. Wight and Mr. Arnott, in 1834, it is stated that *Stalagmitis cambogioides* (of Murray) is a species of Garcinia, and perhaps identical with *Garcinia Cochinchinensis* of Choisy, *Oxycarpus Cochinchinensis* of Loureiro. The whole of the account given by Murray

of his *Stalagmitis* appeared to me, at the time I communicated my observations to the Royal Society, so enigmatical, that I felt unable to form an opinion as to what it is; but I expressed my fears that the statement of Wight and Arnott only threw out another temptation to blunder; for Murray says, that in his plant, the flowers are arranged on a common footstalk, generally more than an inch long, in the axils of the leaves, jointed and bearing the pedicels, which are twice the length of the flowers themselves, in verticels at the joints, and that the fruit is globular, white, slightly reddened on one side, and sometimes twice the size of a large cherry; while Loureiro and Choisy describe their plant as having clustered nearly sessile flowers, with a pear-shaped reddish-yellow fruit, two inches in diameter. Wight and Arnott further say, that the *Stalagmitis cambogioides* of Moon is the *Xanthochymus ovalifolius* of Roxburgh; but Roxburgh describes his plant as having a three-celled ovary, a fruit as large as a small apple, while the genus is partly characterized by the flowers having five petals, and by the presence of five large truncated glands, alternating with the fasciculi of stamens. On the other hand, Mrs. Walker's drawings, and specimens of the fruit sent by Mr. Blair to Dr. Duncan, shows that this, like the fruit of *Garcinia Morella*, is four-celled, and not larger than a cherry; and in the specimens which Mrs. Walker has sent to me, I never find more than four petals, and cannot see a trace of these glands. I only mention these circumstances now, to show the inextricable confusion in which the subject lay, and in which it would have remained, had it not been for Mrs. Walker and the kindness with which Mr. Brown attended to my request that he would examine the specimens of König in the Banksian Herbarium. This examination has reconciled most of the contradictions of authors in a way which could hardly have been anticipated; the authoritative specimen of König is a compound, and consists of the flowers of *Xanthochymus ovalifolius*, with what seems the branch, leaves, and fruit of the plant which in Ceylon yields Gamboge. I give authority to this statement by quoting the letter of Mr. Brown. "The

plant sent pasted by König to Sir Joseph Banks, as one specimen, I have ascertained to be made up of two plants, and very probably of two genera. The union was concealed by sealing wax. The portion in flower, and which agrees in structure with Murray's account, is, I have no doubt, the *Xanthochymus ovalifolius* of Roxburgh. *Stalagmitis* and *Xanthochymus* are therefore one genus, as Cambessèdes has already observed, giving the preference to the earlier name of Murray. This, however, forms but a small part of the whole specimen, the larger portion being, I am inclined to think the same with your plant, of which I have seen, and I believe still possesss, the specimen you sent to Don.* The structure, however, of this great portion cannot be ascertained from the few very young flower-buds belonging to it. It approaches also very closely, in its leaves especially, to that specimen in Hermann's Herbarium, which may be considered as the type of Linnæus' *Cambogia Gutta.* A loose fruit, pasted on the sheet with König's plant, probably belong to the larger portion, and resembles Gærtner's *Morella.*"

It appears then that the generic name of *Xanthochymus* must be dropped, and that the species which belonged to this genus must receive the appellation of *Stalagmitis.* It seems too, that the generic character of *Stalagmitis* by Murray, so far as regards the flower and the inflorescence, was not taken from the plant he meant to describe, but from the flowers of *Xanthochymus (Stalagmitis) ovalifolius*, which König had inadvertently fastened to it; and lastly, that it is not known that any specimens of the flowers of the plant which Murray meant to describe, at least not any sufficiently perfect for examination, had been received in Europe, till those arrived which I owe to Mrs. Walker. The examination of these, proves that the plant is no *Stalagmitis.* It differs wholly in the number of the parts of the flower and cells of the fruit, in the structure of the calyx, corolla, and stamens; in the absence of intervening glands between the stamens, in the structure of the leaves, in the appearance of the fruit, and in the

* One of these received from Mrs. Walker.

structure of the persistent stigma. While I remain quite certain that this plant is the *Garcinia Morella* of Gærtner, an opinion which was first formed from an inspection of the specimen in fruit from Mr. Blair, the examination of Mrs. Walker's specimens has induced me to remove the plant from the genus *Garcinia*. The structure of the stamens is quite peculiar, and quite unlike that of any species of *Garcinia* with which I am acquainted, in which the free portion of the filament is thread-like, and the anther bilocular, opening longitudinally. In Mrs. Walker's flowers, on the contrary, the free part of the stamens is thick and clavate, and the anthers open by the complete circumcision of a singular umbilicate, flat, and terminal lid, the elliptical pollen-granules being immersed in cellular substance.

For these reasons, I cannot hesitate in believing that the Gamboge plant of Ceylon belongs to a nondescript genus, characterized especially by the stamens, which have suggested the name of *Hebradendron*. Having communicated this opinion to Mr. Brown, he replied, "In your plant, the structure of the anther is indeed very remarkable, and might well induce you to consider it as forming a distinct genus; but it is right to add, that approaches to this structure, and which serve to explain its analogy with the ordinary structure of the family, exist in *Garcinia*, with which I suppose your plant would agree in its female flower, as well as in fruit."

As I have never seen the female flower, nor any drawing of it, I cannot add to the probability which is given to this conjecture by Mr. Brown having formed it, except by stating, that there are within the persistent calyces of the fruit, abortive filiform stamens, very much resembling those which are found similarly attached to the fruit of *Garcinia*.

The resemblance to the Ceylon plant, of the inflorescence and form of the flower-bud, of *Garcinia elliptica (Wallich's List, No.* 4869,) led me to examine its structure in connexion with this subject, and I found it also to have male blossoms, with stamens precisely similar. Sir W. J. Hooker was also struck with the resemblance, and obligingly forwarded to me

his specimen for examination. His flowers were further advanced than mine, and on my requesting him to steep one, he sent me drawings which it is impossible to distinguish from those taken from the Ceylon plant. It is unfortunate that we do not know the female flowers in either species ; and yet, if I do not misunderstand Mrs. Walker, or if she is not mistaken, which is less likely, the Ceylon plant is monæcious.

It is very certain that the tree of Ceylon yields a *Gamboge*, fit for all the purposes of that from Siam, and equal to it in quality, though from the process by which it is prepared for the market not being so perfect, its appearance is less attractive, and the price must be depreciated till that process is improved. At present, however, we have no direct testimony as to the tree which affords the *Gamboge* of Siam. Its being the same with that which in Ceylon yields this substance may be doubted. It is perhaps, and more probably, a nearly allied species of the same genus ; this affinity appearing from the experiments of Dr. Christison, showing all but an identity of chemical composition in the product, and from their medicinal effects being precisely the same, as has been proved in Ceylon, and in this country, both by Dr. Christison and myself.

It seems probable, from some parts of the description in the *Flora Indica*, and the quality of the Gamboge yielded by it, that *Garcinia pictoria*, Roxb., may prove to be another species of this genus ; but in this conjecture I must be wrong, if Buchanan is correct in considering this the same as *Oxycarpus Indica (Encycl. Method. Suppl.* 4. 257.) I think, however, Buchanan is mistaken, for he deems it, at the same time, synonymous with *Garcinia Indica* of Choisy, and with "Arbor Indica Gummi guttam fundens," &c. of Burmann ; while, in fact, the specimen in his Herbarium, from which he makes these references (No. 1118) is *Garcinia cornea.* The locality where *Garcinia pictoria* is found (Wynaad) being limited, and the tree having been, formerly at least, well known at Tellicherry, it is probable that specimens may be procured to ascertain the fact.

HEBRADENDRON.* *Graham.*

Nat. Ord. GUTTIFERÆ.—Class and Ord. MONÆCIA (or Diæcia?) MONADELPHIA.

GEN. CHAR. HEBRADENDRON. *Flores* diclines. *Masc. Calyx* membranaceus 4-sepalus, persistens. *Corolla* 4-petalla. *Stamina* monadelpha, columella 4-gona, antheræ terminales, operculo umbilicato circumscisso. *Fæm.* incognitus. *Bacca* multi (4) locularis, loculis monospermis, staminibus quibusdam abortivis liberis basi circumdata, stigmate sessile lobato muricato coronata. *Cotyledones* crassæ, coadunatæ. *Radicula* centralis, filiformis.—Arbores *foliis integris.*

1. Hebradendron *cambogioides;* floribus masculis axillaribus, fasciculatis ; sepalis junioribus subæqualibus ; foliis obovato-ellipticis, abrupte subacuminatis.

Synonyms.

Carcapuli Linsot, *Herman. Mus. Zeylan. p.* 26. *Ibid.* in *Rheed. Hort. Malab.* 1. 42. *in nota.*—Ray *Hist. Plant.* 2. 1661. *Samuel Dale Pharmacop.* 327.

Arbor Cambodiensis Guttam Gambi fundens. *Pluk. Alm.* 41. *Ibid. Mantissa* 20.

Arbor Indica Gummi guttam fundens, fructu dulci rotundo, Cerasi magnitudine, Carcapuli Acostæ *J. Burmann, Thesaurus Zeylan.* 27.

Cambogia Gutta. *Linn. Fl. Zeylan.* 87. (*excel. omn. synpræter. Dale, Ray, Burm. Herm.*) *N. L. Burmann. Fl. Indic.* 119. (*excel. Syn. Pluk. et Rheed.*)

Mangostana Morella. *Gært. Fruct.* 2. *p.* 106. *t.* 105.

Garcinia Morella. *Desrousseaux in Lam. Encycl. Method.* 3. 701. *Pers. Synops.* 2. 3. *Choisy in De Cand. Prodr.* 1. 561.

Stalagmitis Cambogioides. *Moon's Cat. of Plants in Ceylon, Part I. p.* 73.

DESCR. A *tree* of moderate size. *Leaves* opposite, petiolate, obovato-elliptical, abruptly subacuminate, coriaceous,

* From ἐβραῖος ἀνδρὸς, in allusion to the peculiar dehiscence of the anthers.

smooth, shining, dark-green above, paler below, veins in the recent state inconspicuous, especially above ; in the dried state, distinct on both sides. *Flowers* unisexual, monæcious (or diæcious ?) *Male* small (eight to nine lines across,) clustered in the axils of the *Petioles*, on short single-flowered peduncles. *Sepals* four, subequal, imbricated, concave, membranous, veined, the outer subentire, and somewhat coriaceous in the bud, the inner sparingly denticulato-ciliate, yellow on the inside, yellowish-white on the outside. *Petals* four, spathulato-elliptical, coriaceous, crenulate, longer than the calyx, yellowish-white, red on the inside near the base, deciduous. *Stamens* monadelphous ; column four-sided ; *Anthers* in a roundish capitulum, terminal upon a short clavate free portion of the *filament*, opening by the circumcision of a flat umbilicate lid ; *pollen* yellow, granules elliptical. No trace of a *Germen*. *Female Flower* unknown. *Berry* about the size of a cherry, round, with a firm reddish-brown external coat, and sweet pulp, four-locular, surrounded at the base by the persisting *calyx* and a few free abortive *stamens*, crowned with the four-lobed tubercled sessile *Stigma ;* loculament single-seeded. *Seeds* large in relation to the berry, reniform-elliptical, compressed laterally, integuments yellowish-brown, easily separable into two layers ; *Cotyledons* thick, cohering into an an uniform cellular mass ; *radicle* central, filiform, slightly curved.

Native of Ceylon.—For the color and several other parts of the description, I am indebted to Mrs. Walker.

Fig. A. Male flowering branch. Fig. 1. Front view of a flower. 2. Back view of ditto. 3. Side view of the Calyx and column of Stamens. 4. Column of Stamens taken out from a bud. 5. Anther :—all but 4 and 5 *nat. size.*—B. Fruit-bearing branch. Fig. 1. Section of the fruit with its four seeds :—*nat. size.*

2. Hebradendron *ellipticum ;* floribus masculis axillaribus, fasciculatis ; sepalis exterioribus junioribus minoribus ; foliis lanceolato-ellipticis, apice sensim attenuatis.

Synonym.

Garcinia elliptica. *Wall. List of Indian Plants, No.* 4869 (*not Choisy in De Cand.* Prodr. 1. 516.)

I know nothing of this species, but from the specimens sent by Dr. Wallich to Sir W. J. Hooker's Herbarium and to my own. The specific character which I have drawn up, may therefore seem insufficient to distinguish it ; and I might perhaps, have considered it only a *variety* of *H. Cambogioides*, but for the complete identity of form in the specimens from Dr. Wallich ; their *prima-facie* difference from any of those received from Mrs. Walker ; their considerably larger dissimilar leaves, and also their very different geographical position, less unlikely to possess natives of Siam than of Ceylon, Dr. Wallich's plants were obtained in Silhet.

Companion to the Botanical Magazine.

ART. V.—ON THE PERCHLORATE OF THE OXIDE OF ETHULE OR PERCHLORIC ETHER. By Clark Hare and Martin H. Boye.

The energetic properties of perchloric acid, and its stability, compared with the other compounds of chlorine with oxygen, led us to the belief that this acid might be combined with the substance which performs the part of a base in that class of organic salts which are generally designated by the name of *ethers*, and for which Berzelius, in consequence of his theoretical views, has adopted the name of oxide of ethule. For this purpose a concentrated solution of perchlorate and sulphovinate of barytes, in equivalent proportions, was subjected to distillation. The sulphovinate of barytes may be considered as a double sulphate of barytes and the oxide of ethule ; and we anticipated that, when heat was applied, a double decomposition would take place between the latter and the perchlorate of barytes. So long as the salts remained in solution no reaction occurred, but as soon as they became solid, in con-

sequence of the distillation of the water, a reciprocal decomposition ensued, and a sweet ethereal liquid distilled into the receiver. This *liquid* is the *perchlorate of the oxide of ethule*.

As this substance is extremely explosive, in order to prepare it with safety it is necessary to operate on small quantities. We have employed from seventy to ninety grains of crystallized sulphovinate of barytes, with an equivalent proportion of perchlorate of barytes;* but we would recommend, especially on first performance of the experiment, the employment of considerably smaller quantities. The salts should be intimately mixed in a mortar, and placed in a small retort attached to a refrigerator containing ice, and a receiver similarly cooled. The retort is to be heated in an oil-bath, in which a thermometer is suspended, so as to indicate the temperature. A wooden screen, furnished with openings, covered with thick plate-glass at such intervals as to afford a full view of the different parts of the apparatus, should be erected in front of it, and strings passed around the screen and attached to a bar traversing on a pivot, and supporting an argand spirit lamp, by which heat is communicated to the oil-bath, so as to enable the flame of the lamp to be removed from or applied to the apparatus, according to the indications of the thermometer, without exposing the person of the operator. After the heat has reached 212° F., below which the salts employed do not react on each other, it should be raised very gradually, and the distillation finished below 340° F. Under these circumstances but little danger is to be apprehended from the retort, but the ether in the receiver must be treated with the greatest caution, since it has exploded in our hands in attempting to remove it with a pipette from the stratum of water which covers it.

* The amount of barytes in the perchlorate should be ascertained by an experiment, as it retains water with great tenacity. It may be worth while to mention, that the perchlorate of potassa cannot be substituted for the perchlorate of barytes, since the sulphovinate is decomposed without acting on it. We were equally unsuccessful in an attempt to procure the ether by the distillation of perchlorate of barytes and concentrated sulphovinic acid.

This water, therefore, should be removed by the cautious use of strips of blotting paper, moistened at the end, and introduced into the tube employed as a receiver.

To avoid the danger attendant on the management of the ether in its pure state, it may be received in strong alcohol, since it is not explosive when dissolved in alcohol. If the experiment be performed with seventy grains of sulphate of barytes, from one to two drachms of absolute alcohol will be found sufficient for this purpose. By the addition of an equal volume of water, the ether may subsequently be separated from this solution, in small quantities, for the purpose of examination. But, in this case a loss of ether is sustained, by the decomposing influence of the water employed.

The perchlorate of ethule obtained in this way is a transparent, colorless liquid, possessing a peculiar, though agreeable smell, and a very sweet taste, which, on subsiding, leaves a biting impression on the tongue, resembling that of the oil of cinnamon. It is heavier than water, through which it rapidly sinks. It explodes by ignition, friction, or percussion, and sometimes without any assignable cause. Its explosive properties may be shown with but little danger, by pouring a small portion of the alcoholic solution into a small porcelain capsule, and adding an equal volume of water. The ether will collect in a drop at the bottom, and may be subsequently separated by pouring off the greater part of the water, and throwing the rest on a moistened filter, supported by a wire. After the water has drained off, the drop of ether remaining at the bottom of the filter may be exploded either by approaching it to an ignited body, or by the blow of a hammer. We are induced to believe that, in explosive violence, it is not surpassed by any substance known in chemistry. By the explosion of the smallest drop, an open porcelain plate will be broken into fragments, and by that of a larger quantity, be reduced to powder. In consequence of the force with which it projects the minute fragments of any containing vessel in which it explodes, it is necessary that the operator should wear gloves, and a close mask, furnished with thick glass-plates at the aper-

tures for the eyes, and perform his manipulations with the intervention of a moveable wooden screen.*

In common with other ethers, the perchlorate of ethule is insoluble in water, but soluble in alcohol; and its solution in the latter, when sufficiently dilute, burns entirely away without explosion. It may be kept for a length of time unchanged even when in contact with water; but the addition of this fluid when employed to precipitate it from its alcoholic solution, causes it partially to be decomposed. Potassa dissolved in alcohol, and added to the alcoholic solution, produces, immediately, an abundant precipitate of the perchlorate of that base, and, when added in sufficient quantity, decomposes the ether entirely. It would appear, therefore, impracticable to form either perchlorovinates or perchlorovinic acid.

We have subjected the perchlorate of ethule to the heat of boiling water without explosion or ebullition.

It may be observed that this is the first ether formed by the combination of an inorganic acid containing more than three atoms of oxygen with the oxide of ethule, and that the chlorine and oxygen in the whole compound are just sufficient to form chlorohydric acid, water and carbonic oxide with the hydrogen and carbon.

The existence of a compound of the oxide of ethule with an acid containing *seven* atoms of oxygen led us to attempt to combine, by the same method, this base with nitric acid. For this purpose we subjected a mixture of sulphovinate and nitrate of barytes to the same treatment as described above, but the reaction, even when conducted with the greatest possible care, is destructive, hyponitrous ether and gaseous matters being the principal products obtained. Nor were we more successful in our attempt to procure a sulphurous or hyposulphuric ether by the same process.

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* Having sufferred severely on several occasions from the unexpected explosion of this substance, we would earnestly recommend the operator not to neglect the precautions mentioned above.

ART. VI.—MILDEW, OR MELDEW.

After reading an essay in the last number of the Cabinet, headed "Blight on Wheat," I was induced to read what numerous authors had written on the subject of mildew, rust, and blight; but on reflection, in regard to the *terms*, it was thought best to expunge the latter, as too general and indefinite to be applied to a specific form of disease, the character of which is well known to farmers, though the *cause* is not well understood. We say, familiarly, that any species of grain, fruit, &c., that fails in arriving at perfection, is *blighted*, without any reference to the form, character or cause of the disease or accident, which has given rise to the failure.

The term *mildew*, or *meldew*, which I suspect was the original word, is formed of the word *mel*, which means honey, and *dew*, which needs no explanation; the combined term being, in plain English, *honeydew*, which, no doubt, took its designation from a sweet substance found on the surface of the wheat after it became diseased, and which is now believed to be the excrement of very small insects, which attack the plant after the hand of death has come upon it, and decomposition has commenced. The term *rust* needs no explanation to the farmer who has once suffered by this form of disease in his grain crop. These two terms indicate forms of disease, both of which, it is believed, proceed from one common cause, and are only slight modifications of the same disastrous malady.

Some of the authors which have been examined, ascribe the disease to great heat, some to hoar frost or cold after great heat, electricity, diseased seed, disease of the root of the plants, the presence of the barberry bush, fungi, insects, wind from particular quarters, and various other causes, all equally unsatisfactory.

It is pleasant and satisfactory to be able to trace the diseases,

both of animals and vegetables, to their true cause, even if we should not be enabled to prescribe a remedy for them; and upon reflection in regard to the various circumstances connected with the mildew in grain-crops, some thoughts have arisen and have matured into opinions, which I will throw into the common stock, that farmers may judge of them, and see how far they agree with their own experience and observation.

The conditions under which it is believed that wheat arrives at the greatest perfection are, a cool season and a reasonably dry atmosphere at the time of the filling and maturation of the grain; it being assumed that the soil is sufficiently moist to furnish the requisite nutriment for a healthy state of the plants.

The summer of 1816 was of this description, and the wheat of that year was of extraordinary weight and fineness; and what was then considered of equal importance, the crop, when brought to market, sold for three dollars per bushel of 60 lbs., a price it has never since commanded. A worthy farmer, residing in Montgomery county, had that season an average of 32 bushels and 8 lbs. per acre for his whole crop, and sold it for 3 dollars per bushel, being a little more than 96 dollars per acre, and the farm on which it grew cost him 24 dollars per acre some twenty years previous.

The circumstances, which are supposed to be always present in a greater or less degree when the crop becomes diseased with *mildew*, are the following, viz.: The atmosphere saturated with moisture, in the form of fog or otherwise, a high temperature of the air, and scarcely a breath of wind stirring, the latter being a necessary consequence of the former conditions, because, if the wind was active, the moisture would be dissipated and the heat rendered less sensible. In fact, such weather as is familiarly known by the term hot and muggy, and which sometimes relaxes the human system to that degree that it seems as if it was on the point of dissolving; the reason being, that the air is so saturated with moisture that it refuses to take up the insensible perspiration from the surface of the human body, and the heat, which would necessarily go

along with it, remains pent up within us, without a possibility of escape, to our great suffering and discomfort.

There are other conditions of the crop, which render the above circumstances more certainly fatal, but it is doubted whether *alone* they would be much detrimental in producing mildew—such as a very succulent, vigorous growth, produced by manuring too highly, &c.

Now for the *theory;* the word I don't like much, because farmers in general complain so much about theories; but have them we must, while men continue to *think;* for if we think about facts, we are constantly forming theories, in spite of our wishes to the contrary; but theories are only bad or wrong when they don't explain facts, and of this every man must judge for himself. If theories are true and give sound reasons for things, they are good theories, if not, they are bad, and should be discarded without ceremony.

All plants derive their nutriment from the earth, and take it up in a state of very dilute solution in water; this is elaborated in their organs, in a way incomprehensible to us, and deposited where it is needed, to promote the growth and expansion of the plant, and enable it to perform the functions designed in its creation; and the great object would seem to be, to cause it to perfect its seed and continue its species. When this deposit of nutriment is made, the water, which was its vehicle of conveyance, is thrown out of the plant as excrementitious by proper exhaling vessels, and is dispersed in the form of vapor, in the atmosphere, and the vessels of circulation, which are in continual action, introduce continued supplies of similar nutriment duly prepared for deposit, and throw off the water as before, so that there is never a vacuum in the plant.

This process is in continual action till the plant is perfected, and the quantity of water thrown off during the progress of vegetation is almost incredible, as would appear by some very accurate experiments made to indicate the amount. Of 15 parts of water taken up by some plants, 13 are transpired, and of the lowest on the scale, of 5 parts taken up 4 are discharged by exhaling vessels.

Wheat and other plants, when they have acquired their full growth, commence the interesting business of perfecting their seeds, in order to perpetuate their kind; and then nature brings all her powers into requisition to effect this remarkable process. The vessels of the plant are distended with the proper fluid making its way to the seed-vessel, which has been duly prepared to receive it, which is there deposited in the form of a milky juice, when the water, which has been the vehicle for its conveyance, is discharged through exhaling vessels into the atmosphere, and another supply from the same source is constantly in the rear, to be disposed of in a similar manner; and so the process goes on—provided there is no unfortunate interruption from external causes—till each grain is filled with farina, when, the great work being completed, the circulation ceases to be carried on, and the whole is dried and hardened for preservation.

When this process is going forward, it will be perceived that a vast proportional quantity of water must be constantly discharged into the atmosphere, otherwise, space would not exist in the hull of the grain for additional supplies of the diluted nutriment, which is continually arriving at its destined depository; but should the atmosphere at this critical period unfortunately be *saturated* or *surcharged* with *moisture*, as has been before hinted, it will be unable to take up and carry away that which the grain must necessarily part with, and which is now an incumbrance to it, in order to make room for an additional supply of the fluid which would increase the deposit of farina. This inability of the air to take up an additional load of moisture, under the circumstances of its previous *saturation*, prevents it also from carrying off the heat from the wheat, so that the temperature of the whole plant is increased much above the proper standard of its healthy action; for the temperature of plants that transpire moisture freely is constantly kept many degrees cooler than the surrounding atmosphere, or bodies destitute of vital action. This retention of excrementitious moisture suspends the circulation, for it can't move unless it can get vent, and that and the

expansion occasioned by increase of temperature produce congestion, and burst the vessels of circulation, and discharge their contents into the cellular texture, destroy the vitality of the plant, and leave the hull only partially filled with farina. Heat, air and moisture, the agents of putrefaction, being present, decomposition begins, and the surface of the plant soon displays signs of decay. This destructive process first shows itself in the smallest part of the stalk, near the head, which is of most recent formation, and consequently most succulent and tender, and most liable to rupture. The rust is probably occasioned by the heat and internal pressure enlarging the pores of exhalation and discharging the sap on to the surface of the stalk, and when evaporation carries off the moisture, the residuum displays itself somewhat like the rust of iron. After the rupture and discharge of the sap-vessels, the surface of the plant is covered with mucous which is adhesive, and this will account for the seeds of fungi, which are supposed to be floating in abundance in the atmosphere, taking root and vegetating in the decaying structure; and hence the supposition, that fungi are the *cause of mildew.*

The presence of animalcula may be accounted for on the same principle, for nature is ever economical, and wherever animal or vegetable substances are in the progress of decay, mouths are found ever ready to convert dead matter into food for living things, so as to perpetuate the largest possible amount of animated existence. On the death of the plant, the tender succulent fibres of the roots immediately decay, and on drawing them from the ground, the appearance of them has led many to suppose that they had thus discovered the true *cause* of the disease of the plant, when, in fact, it was only the *effect* of its previous dissolution.

It may be objected that if the mildew is the result of a general saturation of the atmosphere with moisture at a particular period, that all wheat should be equally injured by it; when the fact is well known, that of contiguous fields one will be destroyed and the other remain uninjured. This apparent contradiction is accounted for by the uninjured wheat

being more forward in filling than the other, for the whole mischief takes place in a few days, perhaps a few hours ; and where the grain has received the requisite supply of nutriment the circulation is diminished or suspended, and there is no danger of injury from the canals breaking their banks and overflowing.

The grain in the same inclosure is often partially injured ; in low and damp spots, or where it is lodged, for want of the requisite circulation of the air to dissipate the moisture, the injury is great from mildew; when in the higher and drier parts of the same field, it is protected from injury, by a freer circulation preventing the mischief by carrying off the excess of moisture and promoting a healthy transpiration from the plants.

The elasticity of plants favors their being put in motion by the wind, and this no doubt increases the circulation of the sap, in the same way that motion in animals promotes the circulation of the blood ; and, at the same time it favors the evaporation of moisture and promotes a healthy condition. On this principle, it is supposed that good may arise from passing a rope extended across the ridges of wheat in such a manner as to communicate motion to the stalks, and in some measure dissipate the excess of moisture on the principle of *fanning*, as has been recommended by some writers on the subject of mildew. But perhaps the most effectual plan of guarding against this fatal disease would be to seek for and sow only the earliest varieties of wheat, which fill before the season arrives most likely to be accompanied by that condition which is the cause of injury.—AGRICOLA.

Farmer's Cabinet.

ART. VII.—EXPERIMENTS APPLICABLE TO THE STUDY OF ALCOHOL, SPIRIT OF WOOD, AND ETHERS. By M. KUHLMAN.

IN this account, my aim has not been to examine the speculations relative to the chemical constitution of the ethers, but to amplify those facts which would appear to lead us to place so important a portion of our theories upon some immoveable basis.

I have, therefore, given to all my experiments a special tendency towards a fixed system, and, in my equations, I have used the crude formulæ of $C^4H^{12}O^2$ and $C^2H^8O^2$, to designate alcohol and spirit of wood.

1. I have divided my essay into five parts. In the first, I take a general view of the compounds which alcohol and ether form with bodies attractive of water. Having indicated the circumstances under which alcohol and ether play the parts of water of crystallization, I am thence led to attribute to these bodies the characters of acids or of bases, whenever they enter into combinations possessing the character of saline matter. It is not without some degree of hesitation that I admit the existence of alcoholic compounds, in which alcohol plays the part of a base. Prepossessed with ideas concerning the composition of alcohol, which have a tendency to consider it as a hydrate of ether, I have been led to view the combinations of alcohol as combinations of ether and water. There is nothing to oppose this opinion, but there is also nothing to favor it strongly; and certainly, on examining the question without prepossession, we may admit, without difficulty, the existence of alcoholic compounds, however little stability they may possess under some circumstances. These questions, however, I leave to the authors of the different theories of etherification.

I have thought it necessary to admit the existence of alcoholic

compounds, because I have been able to distinguish them from another equally numerous series of compounds, which I have obtained by the direct combination of ether with substances attractive of water, and of which the properties differ essentially from those of the alcoholic compounds. Thus, while by the action of water my alcoholic compounds always yield alcohol, my ethereal compounds always afford ether, while some alcoholic compounds alter by heat, producing ether, oil, &c., the corresponding ethereal compounds volatilise without change ; of this number are the compounds formed with perchloride of tin. Other alcoholic compounds are voporizable without alteration, and do not change into ethereal compounds but under the influence of a temperature of about 140° ; such is the combination of alcohol with the fluoride of boron.

What I have said of alcohol as to the combinations into which it enters, is equally applicable to the spirit of wood.

I have made manifest that the part of a base does not appertain to alcohol, ether, and spirit of wood, but also to the ethers of the hydracids under similar circumstances ; and have also made known the results of some experiments upon this species of compound.

2. In the second part of my essay, I have examined the action of heat upon the alcoholic and methylic compounds ; first, those where alcohol and spirit of wood act as acids ; and after where these bodies form the electro-positive elements of the compound.

The combinations of powerful bases with alcohol or spirit of wood, do not give rise to ether by the action of heat ; their decomposition takes place at a temperature but slightly elevated, and those portions of alcohol or spirit of wood which are retained, are not decomposed but at a temperature of about 250°, and yield gaseous hydro-carburets, and under some circumstances an empyreumatic oil.

The combinations of alcohol and certain metallic chlorides always yield ether at the temperature of about 140°, when the combination is submitted to heat in presence of an excess of alcohol ; the ether thus disengaged is always in part sulphu-

ric ether. When we operate with an excess of the chloride, hydrochloric ether is the sole product, and may then be obtained at the temperature of 85° or 90°. The ether is not always disengaged in a free state; for on operating with the volatile chlorides, it is frequently obtained, and especially towards the end of the distillations, in combination with these chlorides.

By distilling a mixture of 100 parts of perchloride of tin with 53.79 parts of absolute alcohol, or 2 atoms perchloride to 3 atoms alcohol, the largest proportion of ether is obtained.

The most suitable proportion of perchloride of iron is, 100 perchloride and 57.82 absolute alcohol, or 1 atom perchloride to 2 atoms alcohol. When a larger amount of alcohol than above indicated is used, the excess distils over previous to the formation of ether.

The presence of some water may render a modification of these proportions necessary, but will not prevent etherification from taking place.

Mixtures of absolute alcohol and perchloride of tin or anhydrous perchloride of iron, made in the proportions represented by the formulæ, $2SnCl^4$, $3C^4H^{12}O^2$ and Fe^2Cl^6, $2C^{14}H^{12}O^2$, may be preserved several days in vacuo without loss and without change.

The formation of ethereal compounds takes place under ordinary circumstances, corresponding to those which accompany the formation of alcoholic compounds. On mixing 100 parts of perchloride of tin with 57.88 parts of absolute ether, or 1 atom perchloride and 2 of ether, and placing this mixture in vacuo at common temperatures, an excess of free ether volatilises, amounting to one-fourth of the quantity used, so that there remains a compound having the formula $2Sn^43C^4H^{10}O$. When this product is heated in vacuo to 40° or 50°, it distills and condenses in the neck of the retort, in the state of fine brilliant crystals, under the form of rhomboidal tables.

Etherification has been produced by the action of heat on the alcoholic compounds of perchloride of antimony, chloride of zinc, and chloride of aluminium. The last yields hydrochloric

ether only. The chloride of arsenic does not yield ether. By the action of heat the compounds of fluoride of boron yield at 140° an ethereal compound which distils over; before reaching 140°, a part of the alcohol vaporises without alteration. The product in the retort in succession is changed into an ethereal compound, yielding ether by mixture with water. Operating with perchloride of tin, the residue in the retort, after the disengagement of part of the ether, yields alcohol constantly by contact with water. This difference may be attributed to the great volatility of the ethereal compound of the perchloride of tin, on which account it escapes in vapor as soon as formed, which does not happen with the compound of ether and fluoride of boron, this vaporising only at 140°. The fluoride of silicon does not convert alcohol into ether.

3. After the etherification of alcohol by the metallic chlorides and fluorides, I examined the action of agents upon the spirit of wood at an elevated temperature. I have already stated that spirit of wood forms alcoholic compounds. The action of heat upon those compounds where the spirit of wood plays the electro-positive part, presents great analogy with that which it exercises on the alcoholic compounds. When, in a mixture of spirit of wood and etherifying chloride, the spirit of wood predominates, it forms, as in alcohol, two species of ether: one a peculiar methylic ether, which condenses at 0° and remains liquid at ordinary temperatures, and a methyl-hydrochloric ether which condenses only at very low temperatures. When the chlorides are in great excess, the latter ether only is produced. The temperatures at which etherification of spirit of wood takes place are generally less elevated than those suitable for alcohol. They are generally from 125° to 150°. The proportion most favorable to produce etherification by perchloride of tin appears to be 2 atoms spirit and 1 perchloride. The reaction of etherifying chlorides upon spirit of wood presents this remarkable difference with that produced with alcohol, that the mixture with spirit of wood always becomes reddish-brown, and on the addition of water deposits a resinous matter, which does not happen with

alcohol ; finally the residue of the distillation always contains a resinous matter or carbon, and the chlorides are reduced to proto-chlorides.

The fluoride of boron changes spirit of wood into common methylic ether, difficult to condense. This ether is never disengaged in an isolated state, but always combined with fluoride of boron, from which it separates on contact with water.

The fluoride of silicon does not yield ether with spirit of wood any more than with alcohol.

4. The fourth part of my essay has relation to the action of anhydrous sulphuric acid upon absolute alcohol. I have proven that, contrary to the received opinion, dry sulphuric acid cannot transform absolute alcohol into ether, and I have ascertained the condition under which this change takes place.

I have ascertained that a mixture of 2 atoms of anhydrous sulphuric acid and 1 atom of absolute alcohol never yields ether, but, that on using a mixture composed of 1 atom of each, etherification takes place at ordinary temperatures, that is to say at 140° to 160°. When a much larger proportion of alcohol is used, the excess distils over before etherification ; but when the quantity of acid is slightly increased a much greater quantity of ether is obtained. The proportions which have given the most ether are, 4 atoms acid to 3 absolute alcohol.

Etherification takes place but incompletely with anhydrous phosphoric acid, and only when the alcohol is in excess.

Anhydrous spirit of wood yields with anhydrous sulphuric acid, methylic ether, when the spirit of wood is in excess.

The most simple manner of accounting for etherification, both in relation to the chlorides and to the anhydrous acids, consists in assimilating the decomposition of the neuter or even basic alcohol compounds, to the decomposition of many of the salts of ammonia, which, from being neutral, pass by the action of heat to acid salts, on losing ammonia ; with this difference, however, that when the alcohol is displaced at the temperature of 140 or 150, it is changed into ether and water. The water is partly retained by the acids, and may even

be wholly changed by the etherifying chlorides, producing hydrochloric acid and an oxide. This mode of viewing the phenomena of etherification affords a ready explanation of how sulphuric acid is able to convert successively into ether an almost unlimited amount of alcohol of a suitable strength, added by little and little to the etherifying mixture; it is not necessary to introduce an occult force as proposed by MM. Mitscherlich and Berzelius.

By considering etherification by a hydrated acid as the result of the decomposition of a bisulphate of alcohol or of ether, (sulphovinic acid,) the reaction is accounted for by attributing basic properties to water. Water does, in fact, play a part in these reactions, for I have well ascertained that, although 2 atoms of anhydrous acid do not yield ether with 1 of alcohol, on account of the excess of acid, yet a much larger proportion of ether is obtained by using 2 atoms of hydrated acid.

In every case of etherification, it is necessary that the decomposition of the alcoholic compounds should take place at 130° to 140° to yield ether. The evidence of this fact will be found in the last part of my essay.

5. I have ascertained that when we distil in vacuo, a mixture of 2 atoms of anhydrous sulphuric acid and 1 of absolute alcohol, a mixture which, under ordinary circumstances, yields ether, ebullition commences at 50°; alcohol distills up to 140°, at which temperature oil of wine and water without ether pass over.

With etherifying chlorides the results are analogous; they do not form a sensible quantity of hydrochloric ether, but with these the oil does not distil even at 160°.

In the reaction of sulphuric acid, the formation of oil of wine without ether at 104°, after a disengagement of alcohol, is worthy of remark; it shows that for etherification in general the temperature of about 140° is absolutely necessary.

As to the oily carburets, they may be obtained even in the cold; as is demonstrated by the slow action of fluoride of boron on absolute alcohol.

In the great number of experiments set forth in this essay, there is, without doubt, some that merit a more extended examination. Such are the reactions of anhydrous acids and chlorides upon the ethers of the hydracids, and by consequence on organic ethers; the slow action of etherifying chlorides and fluorides upon alcohol; analytic research is necessary to obtain fixed ideas on some points, especially on the nature of the liquid methylic ether produced by the action of the chlorides; upon the crystalline compound obtained by the action of water on the result of the slow decomposition of fluoride of boron by alcohol; it is finally proper to examine into the analogy which exists between the compounds I have described and the ethereal salts of Zeize. It would have been more agreeable to me to complete the extent of my researches, but business occupations hindering the further pursuit of this work at present, I have thought proper, on account of the interest of the theoretical question, to bring them, although imperfect, to the knowledge of chemists, and call their attention to the different points which are left undecided.

Journ. de Pharm.

ART. VIII.—NOTE UPON THE CINCHONA BICOLORATA.

The bark, which bears the designation at the head of this article, is ranged by systematic writers among the *False Cinchonas*. The specific name, *bicolorata*, has been more especially bestowed upon it by the continental druggists, while with the English it is known as *Cinchona pitaya*. As the article has made its appearance in this market, we have been induced to present the following information with respect to it, derived from the authorities to which we have had access. The bark itself is described by Guibourt in the following manner: "It is found under the form of straight quills, eight or ten inches long, completely rolled in double or single quills from half a line to three quarters thick, hard and compact, not fibrous, with a short fracture. The exterior surface is very even, of a uniform yellowish gray; the interior surface is of a deep brown or blackish color, sometimes gray, like the exterior, and then the bark does not present, in truth, the two colors, from which has originated its name. The fracture is deep orange; the taste is bitter, disagreeable, analogous to that of angustura; it has no odor. The powder has the color of that of the pale and red barks mixed." This description is not strictly accurate, as, in it is omitted the peculiarity of the external surface, which is of a grayish ashen color, like some of the varieties of *Cinchona palldia*, with irregular ovoid patches of a white appearance, strongly contrasting with the other portion of the surface, and slightly depressed below its level, so as to exhibit a determinate line of separation between them. These patches are of greater size, more irregular and numerous in the larger quills than in the smaller. It is, therefore, most probable that the two distinct colors upon the surface has bestowed the distinguishing name of *bicolorata*.

Merat and Delens state that the true source of the drug un-

der consideration is unknown; it has been suspected that it came from Buenos Ayres. It appears, however, that the English obtain it from the neighborhood of Bogota, and we are disposed to attribute the specimens in our possession to a similar source, as the commercial house into whose hands it came, derived it by way of New Orleans. This route would, most probably, be only taken by an article which was produced at the northern extremity of the bark region, within the district of country known as Colombia.

The same authors conjecture that it is the same bark that was received in Hamburgh in 1819 and 1821, under the name of *Atacamez* or *Tacamez*, and also the same as that described as the *Quina alaranjada* in the *Quinologie* of Balasco, as well as the Memoirs of the Academy of Lisbon for 1814.

The *Cinchona pitaya* of Fee, which is the same as the Piton or St. Lucia bark, must not be confounded with the preceding, which is known as the *C. bicolorata* to this author. The Piton bark is derived from the *Exostemma florabunda*. Batka appears to have confounded the two, and therefore referred the latter to this source; with respect to the plant which affords the bark under consideration, nothing worthy of reliance, has been presented to the public. The conjectures which have been made by the several authors, whose attention has been directed to the subject, are not worth citation. From the analysis which has been made by Bergen, it appears not to contain either cinchonia or quinia, and Prof. Pfaff regards it as not essentially different from other bitters. Pelletier and Petroz, who have also analyzed this bark, obtained from Brera, have detected neither of these two principles, but a bitter substance analogous to colocynthine, which can be given in the doses of from 12 to 24 grains. Cardone, the younger, has detected a yellow principle (resembling that of pale bark,) resin, malic acid, a bitter principle, some mucilage and numerous salts. There was discovered neither tannin or starch.* Guibourt, who appears to have made some chemical experiments with this

* Merat and Delens.

bark, reports, in the table accompanying the description of the false cinchonas, the following reactions: the infusion reddened litmus, with gelatine formed a slight cloudiness, with oak bark a precipitate, with galls a precipitate, with sulphate of iron a greenish black precipitate, with oxalate of ammonia a colored precipitate, with tartar emetic no reaction.

It results from the experiments of Brera,—1st, that the *Cinchona bicolorata*, when given in the quantity of half an ounce, cures intermittent fevers, while two ounces of the common cinchona is required. 2d, that the fevers which are cured by it rarely reappear, which happens when Peruvian bark is employed. 3d, that it has operated with great efficacy in a pernicious cardialgic fever, with vomiting. 4th, that the small quantity in which it is used prevents it from occasioning irritation: it possesses, on the contrary, the property of allaying vomiting, as in the case cited. 5th, that when employed in intermittent fevers, with inflammatory complication, it cures the fever without augmenting the inflammation. Drs. Carminati and Palleta have employed it with the same success, and before them the physicians of Trevise, Ghirlanda, Lovadina, Mainer, Ciotic, Adami, &c.; J. Zanelti, pharmaceutist, of the same city, was the first who pointed out the distinction of this bark from ordinary cinchona.*

In conclusion we may remark, that it has been supposed to be a kind of false angustura; if, by this, it is presumed to contain either brucia or strychnia, such a supposition is evidently erroneous. It may, however, have been confounded with ordinary angustura bark. In a collection of specimens placed at our disposal by a distinguished druggist of this city, is contained one of the bark in question, which is labelled *Cinchona angustura*.

Philadelphia, April 1st. J. C.

*Op. citat.

ART. IX.—HISTORICAL REMARKS CONCERNING THE GREEK FIRE. By J. J. Virey.

Entrusted by the Historical Committee, established by the Minister of Public Instruction, with the examination of the unpublished documents of the fourteenth and fifteenth centuries, relative to the *Greek fire*, we have ascertained that it consists of pyrotechnical compounds, such as resins, camphor, volatile oil of turpentine associated with sulphur, or bitumen, or naptha, and mixed up with nitre to facilitate their combustion; this matter is disposed in the form of a rocket, and enveloped with hide, and projected by artillery. Such are the formulæ for the pretended Greek fire, divulged as secrets by P. Cataneo and other ingenious artificers of the sixteenth and later centuries.

It is obvious that such mixtures do not constitute the true Greek fire, which inflamed under water, and was likewise inextinguishable, according to the reports of the Byzantine historians, Tonarus and Nicetas. Theophanes and Cedrenus attribute its discovery to the Syrian engineer, Callinicus, or to a more ancient author, Marcus Gracchus.

If it be true that the Emperor Constantine burnt, by these means, the fleet of the Saracens in the Hellespont, if he caused this state secret to be kept concealed from other nations up to the tenth century, and, finally, if Vreeahardouin, the lord de Joinville, and other historians of the crusades speak with affright of the terrible explosions of this fire, projected from mortars at the siege of Damietta, in red hot globes of the size of a cask, the compositions before cited cannot be correct.

But we find other curious notices in some ancient writings of the alchymists or Rosicrucians of the middle ages. These are no other than inflammable matters well known, but chemical combinations imperfectly studied, or concealed by design, and capable of dangerous explosion. Julius Cæsar Scaliger

was apprised by them, that with a kind of alum, a compound could be formed which would take fire by contact with water, or even with saliva (*sputo accenditur;*) this is preserved in a vessel hermetically sealed, named αστιοχος by the Greeks, who projected it against their enemies. This was probably a fulminating powder similar to Homberg's pyrophorus, formed from the sulphate of alumina, potassa, and carbon, which takes fire by moisture, or some of the compounds of sulphur, with the regulus of antimony and bismuth, recently discovered by Serullus, and exploding under water.

It is certain that many adventurous attempts of the alchymists, then produced, independently of gunpowder, formidable preparations of which the processes remained secret; it is on this account that every thing which may throw light upon the ancient compositions merits the attention of chemists.

Journ. de Pharmacie.

ART. X.—OF GUARANA AND ITS USE IN MEDICINE UNDER THE NAME OF PAULLINIA. By M. de Dechasteles.

Some months since, a very interesting notice, by Dr. Garvelle, of the guarana or paullinia, has drawn the attention of many practitioners to this new medicine. The frequent use made of the guarana by Dr. Garvelle, whilst physician to Don Pedro, in Brazil, and the good effects which he has since obtained in France, have induced me to communicate to the Society of Pharmacy the different preparations and formulæ in which this medicine has been prescribed by many physicians.

As for the eminently tonic properties possessed by guarana, (called more judiciously by Dr. Garvelle, paullinia,) they may be well attributed to the *tannate of caſeine*, which we have proven to exist in so great a quantity, according to the ana-

lysis made by M. Berthemot and myself, (Journ. de Pharm. Aout, 1840.)

By our experiments it will be perceived that alcohol is the only solvent which will exhaust the guarana of all its active properties; consequently it is necessary to use the hydro-alcoholic extracts, for the different preparations of this medicine.

I will merely call to mind that this extract is obtained by exhausting the guarana with boiling alcohol of 22°, distilling the tincture to withdraw a large part of the alcohol, and then evaporating to the consistency of a pillular extract.

Lozenges of Guarana or Paullinia.

℞ Hydro-alcoholic extract of Guarana 21 gram. 3 decigram. (329 gr.)
Sugar scented with Vanilla 500 gram. (7722 gr.)
Mucilage of Tragacanth q. s.

To be made into lozenges to contain each about ½ gr. of the extract.

From 16 to 20 may be taken daily.

Syrup.

℞ Hydro-alcoholic extract 10 gram.
Simple syrup 1000 gram.

Dissolve the extract in a little boiling water, then add the syrup, and reduce to a proper consistence.

From 45 to 60 grammes may be taken daily.

Pills.

℞ Hydro-alcoholic extracts, any quantity to be made into pills, each containing 1 decigram (1½ gr.) of the extract.

Four or five to be taken daily.

Tincture.

℞ Hydro-alcoholic extract 32 grms. (50 grs.)
Alcohol 500 " (7722 grs.)

Dissolve the extract in the alcohol by the aid of heat.

Ointment.

℞ Hydro-alcoholic extract 8 gram.
Lard 64 "

Soften the extract with boiling water and incorporate it with the lard.

Administration of the Powder of Guarana or Paullinia.

Many physicians employ it in powder, after the manner of the Brazilians, but always with sweetened water.

℞ Powder of Guarana 4 grams.
Scented Sugar 16 "

One or two powders daily.

Tonic Chocolate of Guarana.

℞ Chocolate 500 grams. (7722 grs.)
Powder of Guarana 32 " (50 grs.)

Journ. de Pharm.

ART. XI.—ON KERMES MINERAL. By M. H. Rose.

There is no preparation of antimony which has been subjected to the same amount of study and analytic research as *Kermes mineral;* nevertheless, chemists do not seem to agree in regard to its composition. The greater number, and among these, MM. Gay Lussac, Liebig, Geiger, Henry, jr., Buchner, Robiquet, Duflos, Brandes, Bierman, Pagenstecher, and others, admit that it is composed chiefly of oxide of antimony, united to sulphuret of antimony, whilst Berzelius considers it as not differing from common sulphuret of antimony, SbS^3. Some of my own previous experiments correspond with those of Berzelius.

Kermes mineral differs according to its mode of preparation. I have examined the kermes as procured by three different processes.

1. *Kermes obtained by boiling sulphuret of antimony in a solution of an alkaline carbonate.* When sulphuret of antimony is boiled in a solution of an alkaline carbonate, there is formed a sulphuret of the alkaline metal, holding in solution sulphuret of antimony, a salt of sulphur, and oxide of antimony. The sulphuret of the alkaline metal dissolves, by aid of heat, much sulphuret of antimony, nearly all of which, on cooling, it abandons under the form of kermes, but a very small portion remaining in solution. The oxide of antimony formed, dissolves completely when sufficient of the alkaline carbonate is used; otherwise, a part precipitates, on cooling, along with the kermes; especially if this latter is allowed to remain sometime in contact with the liquid from which it was deposited. Under all circumstances this oxide is mechanically mixed, and not chemically combined with the kermes. Of this any one may be readily satisfied by microscopical examination of this product. True kermes appears under the form of red or reddish brown grains, and if it contains oxide of antimony, there is very clearly to be perceived, more or less abundant crystals, which for the most part are six-sided prisms, but which often appear under the form of fine needles; these are entirely absent when the antimony is dissolved in an excess of alkaline carbonate, under which circumstances there is a more considerable production of kermes.

The oxide of antimony, which may contaminate the kermes, is not combined with the alkali, but by analysis of the kermes, the alkali may always be obtained under the form of a sulphur salt. It contains a small quantity of sulphuret of potassium or sodium, as M. Berzelius has long since demonstrated; forming a salt of sulphur with the highest degree of sulphuration of antimony, SbS^3. It cannot be entirely separated from the kermes by washing. The quantity obtained with the kermes made by boiling sulphuret of antimony in a solution of an alkaline carbonate, is in reality very small.

The presence of oxide of antimony in kermes is easily recognisable without the use of the microscope, by fusion in an atmosphere of carbonic acid gas. The fused kermes, when free

from oxide, forms, when pulverised, a black powder, while if it contains oxide, it is more or less disposed to assume a reddish or brownish tint.

If kermes be heated for some time in hydrogen gas, the sulphuret of antimony, consisting of $\underline{Sb}S^3$, is reduced to metallic antimony, but the salt of sulphur does not undergo the least change, and any antimony which it may contain, united with a greater amount of sulphur, is not brought to a lower state by losing its sulphur. Only a small quantity of water is liberated with which the salt of sulphur was combined. It is usually considered that this water disengaged on treating kermes with hydrogen, is derived from the reduction of the oxide contained in the kermes.

The kermes, as a result of what we have said, cannot be identical with the mineral *Rothspiesglanzers*,* nor as an analogous compound, for this latter is, according to my researches, a compound of oxide of antimony and sulphuret $\underline{\ddot{S}b}+2SbS^3$.

2. *Kermes prepared by fusing sulphuret of antimony with an alkaline carbonate.* This is the ordinary officinal kermes of the Pharmacopœias, which prescribe this mode of preparation.

On fusing the sulphuret of antimony with an alkaline carbonate, it is known that a large amount of metallic antimony separates. The common opinion with regard to this separation is, that the oxide of antimony, by an elevated temperature and the presence of an alkali, is resolved into the metal and antimonic acid.

When the kermes prepared in this way, after many washings, and while yet moist, is boiled with tartar and water, there is obtained from the filtered solution, by means of hydrosulphuric acid gas, a voluminous precipitate of sulphuret of antimony. This effect does not take place with a kermes prepared by boiling in a solution of alkaline carbonate; it contains no

* *Red antimony* of Saxony and Hungary. *Native kermes*, Delisle; *Hydrosulphuret of antimony*, Hauy.

oxide. The kermes obtained by fusion contains, therefore, oxide of antimony, and the oxide only, and not antimonic acid, for by ebullition in tartar, crystals of tartar emetic may be obtained.

I had supposed, depending upon the authority of MM. Gay-Lussac and Liebig, that the quantity of oxide of antimony in kermes, obtained by fusion, was very considerable. But I have long since changed this opinion, as I have found that this quantity varies very considerably according to the different modes of obtaining it, and bears no relation in quantity to the sulphuret of antimony. Microscopic examinations have confirmed this opinion, for kermes has the appearance of a mixed mass of red granules and crystals, the latter being in very variable quantity. We may even by this mode of preparation obtain a kermes which contains very little oxide, and which, after fusion, will yield, when pulverised in an atmosphere of carbonic acid, a powder almost black.

The principal cause of the presence of this oxide in kermes is, that by fusion with an alkaline carbonate, the sulphuret of antimony is completely decomposed, while, by boiling in a solution of the same, the greater part escapes alteration. By fusion there is formed oxide of antimony, and a metallic alkaline sulphuret which dissolves the sulphuret of antimony. On boiling the fused mass in water and cooling the filtered liquor, kermes mixed with oxide of antimony is deposited, this latter precipitating, because the undecomposed alkaline carbonate does not bear a sufficient relative proportion to the decomposed sulphuret of antimony.

This explanation of the reactions taking place in this product does not appear wholly exact, on account of the separation of metallic antimony, or rather there should be another process by which this separation may be explained.

If we concentrate by evaporation the liquor from which the kermes has been deposited, this liquor on cooling will deposit a considerable quantity of large crystals of a well known salt of sulphur, consisting (when carbonate of soda is used) of sulphuret of sodium and sulphuret of antimony, with a maxi-

mum of sulphur, $\underline{Sb}S^5$. If the solution be less at repose for a long time, crystals of carbonate of soda are formed, and there is left a combination of sulphuret of sodium and sulphuret of antimony with a minimum of sulphur, $\underline{Sb}S^3$.

The precipitation of metallic antimony by the fusion of sulphuret of antimony with an alkaline carbonate depends upon the fact that part of the sulphuret $\underline{Sb}S^3$ is changed into metal and into sulphuret of antimony with a maximum of sulphur $\underline{Sb}S^5$. This decomposition taking place from the predisposing affinity of the alkaline metallic sulphuret present, to form a salt of sulphur with the maximum sulphuret.

Less of this salt of sulphur is formed by boiling the sulphuret of antimony in a salt of sulphur, since, as before mentioned, this salt enters but in very small quantity into kermes thus prepared. Its presence should then be attributed to the oxidation of a small quantity of antimony in the persulphuret of antimony.

The most ancient method of procuring metallic antimony, (that of Basil Valentine,) by the mixture of nitre, crude tartaric acid, and sulphuret of antimony, equally depends upon the fact, that there is formed a salt of sulphur with persulphuret of antimony, in consequence of which metallic antimony is separated.

3. *Kermes prepared by boiling sulphuret of antimony in a solution of an alkaline hydrate.* This kermes in external appearance, has no resemblance with those prepared by other means. It forms a thick, voluminous precipitate, which it is difficult to wash and dry.

Boiled in its moist state with tartar, it does not yield oxide of antimony, and the microscope detects no appearances of this oxide. Treated by dilute hydrochloric acid, it disengages, at the first moments of reaction, sulphuretted hydrogen gas, becomes black, and resembles in every respect common sulphuret of antimony.

Treated with hydrogen and a high temperature, there is formed a metallic button, surrounded by a fused mass, upon

which the hydrogen has no action, and from which no sulphur sublimes.

This fused mass is a salt of sulphur composed of sulphuret of potassium and persulphuret of antimony, which is not decomposable by hydrogen and a high temperature. The quantity obtained is very considerable, and by a quantative analysis, appears to be in a determinate proportion to the sulphuret of antimony. The composition of kermes obtained by ebullition in an alkaline hydrate, according to this analysis, is expressed by the formula $(KS+\underline{Sb}S^5)+2\underline{Sb}S^3$; but by prolonged washing, more and more of the salt of sulphur may be taken away. The presence of persulphuret of antimony in this kermes should be attributed, as in that from an alkaline carbonate, to an oxidation of the antimony of the sulphuret by the presence of air.

Ann. der Pharm. and Journ. des Mines.

ART. XII.—ON THE EXTRACTION OF MORPHIA. By Fr. Mohr.*

M. Mohr considers that the proposed process has the peculiar advantage of obtaining the morphia in the most short and easy manner, without the use of alcohol, in the crystalline form, and completely free from narcotine. This process consists in precipitating morphia from its solution in lime, by means of hydrochlorate of ammonia in powder, absolutely in the same way that Chenevix separates alumina from its alkaline solution.

Crude opium is to be macerated in successive portions of water, amounting to three times its own weight, being each time strongly expressed; three or four macerations are sufficient. These liquors are then to be added to a thick milk of lime, which should contain the lime in about one-sixth or one-

* Annal. der Chem. und Pharm.—Vol. xxv.

fourth part of the opium used. If the mixture of lime be poured into the boiling solution of opium, a mass separates, and, by fusion, agglutinates on the sides of the vessel, and is then dissolved with much difficulty. This takes place because the morphia is at first precipitated, while there is as yet not excess of lime to redissolve it. It is therefore better to add the solution of opium to the boiling milk of lime, or to mix both together at a boiling temperature, and afterwards apply heat to complete the process. The liquors are then allowed to boil for a few minutes. The effect produced by the milk of lime in decolorizing the liquors is remarkable. The narcotine is completely retained in the precipitate. The liquid, after boiling with the milk of lime, is then strained, and the residue washed with boiling water and expressed. The liquors are then evaporated to about double the weight of the opium, and promptly filtered to separate some carbonate of lime which is always formed. Again, heating the liquors to ebullition, sal ammoniac in powder is to be added in the proportion of 30 parts for over 500 parts of opium. The form in which the morphia separates, depends upon the state of concentration to which the solution of morphia in lime was brought by the evaporation: if this is very great, the addition of sal ammoniac produces immediately an abundant precipitate, which some minutes of ebullition changes into crystalline needles; if more feeble, it sometimes does not immediately produce a precipitate, but soon after here and there may be distinguished some white needles; the precipitate now appears with great promptness, and sometimes so many crystals are formed as to occupy on deposition one half the bulk of the liquid. Agitation sometimes promotes the crystallization.

The previous decolorization of the liquor by animal charcoal is unnecessary—for the lime itself produces a greater effect than the charcoal. The author is satisfied that sal ammoniac precipitates all the morphia from the solution in lime.—We, however, regret that he has not indicated the quantity of product, comparatively with the amount of opium employed.

Crystallized morphia thus obtained is not absolutely color-

less; to render it more pure it may be dissolved in hydrochloric acid, then boiled with milk of lime, and the filtered liquor precipitated by sal ammoniac. A. G. V.

Journ. de Pharm.

ART. XIII.—SELECTIONS FROM LASSAIGNE'S DICTIONNAIRE DES REACTIFS.—No. 1.

Translated by AUGUSTINE DUHAMEL.

Acetate of Morphia.

THIS salt, prepared by saturating weak acetic acid with pure morphia, and evaporating the solution to dryness, is presented in a grayish white mass, amorphous, granular, pulverulent, and of a disagreeable bitter taste; by spontaneous evaporation in a stove this salt may be obtained crystallized in fascicular needles. It is in the first form that it is met with in the shops for medicinal use.

Acetate of morphia is soluble in water and alcohol, but when evaporated to dryness, or has been a long time exposed to the air, it has lost a part of its acid, and does not then redissolve totally in water except a few drops of acid be added to it.

Composition. It is generally supposed to be formed like other neutral salts with organic basis, of one atom of acid united to one of morphia; consequently 100 parts contain,

Acetic Acid,	13.72	or	1 atom.
Morphia,	86.28	"	1 "
	100.		

Its formula is $\dot{M}o\ \bar{A}$.

Distinctive characters. 1st. Exposed to heat, acetate of morphia melts, puffs up a great deal, blackens and gives out an abundant smoke of an empyreumatic odor. The shining spongy

charcoal which results, calcined in a platina spoon over the flame of a spirit lamp, burns without any residue.

2d. Moistened with concentrated sulphuric acid and a few drops of water, and a mild heat applied, causes vapours of weak acetic acid to be disengaged.

3d. Concentrated nitric acid placed in contact with a small portion of this salt, gives to it immediately a blood-red color, which passes to the orange and afterwards to the yellow, but this phenomenon belongs also to another organic base and its compounds (Brucine.)

4th. A character peculiar to morphia and its salts is, according to the curious observations of Serullas, that of decomposing iodic acid dissolved in water. By placing in contact at the ordinary temperature, a solution of iodic acid with a single grain of *acetate of morphia*, the liquid becomes colored brownish red by the iodine set at liberty, developing immediately the odor of the latter.

The hundreth part of a grain is sufficient to produce a sensible effect, but to detect in this case the presence of iodine set at liberty, it is necessary to dissolve the salt in a few drops of solution of starch and add to it the iodic acid by means of a tube.

The blue color which appears by the iodide of starch thus formed, clearly indicates the decomposition of the iodic acid. An effect not less sensible and more prompt is produced by placing a drop of solution of iodic acid upon paper coated superficially with the starch, and then placing some *acetate of morphia* upon the wetted spot, which, after a few seconds, will take a decidedly blue tint.

5th. Upon moistening a small quantity of *acetate of morphia* with a solution of persulphate of iron or neutral chloride of iron, the mixture (according to M. Robinet,) takes a deep blue color which disappears by the addition of an acid.

6th. The aqueous concentrated solution of morphia precipitates in white flocks by potash, soda, and ammonia, but an excess of these bases redissolves the precipitate if the solution is primitively diluted to some extent with water. The infu-

sion of galls, owing to the tannic acid it contains, precipitates the morphia in the state of *tannate* under the form of white flocks, insoluble in water.

Acetate of morphia considered under a medico legal head. An exposure of the means of detecting the presence of this compound is rendered interesting from its well known poisoning effects, as well as the celebrity attached to it, acquired by a criminal prosecution in 1824 before the court of assizes at Paris, wherein Dr. Castaing was charged with the murder of his friend Hyppolyti Ballet, by poisoning him with *acetate of morphia.*

The man of art, charged with the duty of making the necessary experiments to prove poisoning by *acetate of morphia,* should submit to the above mentioned reactives what remains of the substance supposed to have occasioned death: he should treat it, as well as its aqueous solution, by the means pointed out in the description of the *distinctive characters* of this salt. He will direct his researches to the matters ejected by vomiting, as well as those gathered in the digestive organs after death.

When the matters under examination are liquid, it is necessary, after filtering, to evaporate them by a gentle heat in a porcelain capsule; to treat the extract by boiling alcohol of 40°, and to separate, by filtration or decantation, the insoluble portion. The alcoholic solution then evaporated furnishes an extract in which the *acetate of morphia* crystallizes, if in sufficient quantity; or if not, its presence may be denoted by reactives.

If the matters extracted from the organs are solid, they should be boiled in a capsule with distilled water, acidulated with acetic or hydrochloric acid, and the liquid treated as above directed.

In these investigations the liquids extracted are generally more or less colored—and makes it necessary to discolor them either with purified animal charcoal or to precipitate the coloring matter by subacetate of lead; filter, and pass a current of hydrosulphuric acid gas to separate the excess of lead.

By the aid of these processes which have been put into practice by Messrs. Orfila and Lesueur, it has been frequently possible to discover the presence of very small quantities of *acetate of morphia* in the stomach and digestive canal of men and animals several months after death.

M. Orfila publicly declared, that he could discover in one pint of liquid, by exact analysis, half a grain of *acetate of morphia.*

ART. XIV.—CHEMICAL EXAMINATION OF THE STROBILES OF THE HOP, (HUMULUS LUPULUS.) By T. G. Leroy.

(*Read before the Society of Medical and Natural Sciences of Brussels.*)

The hop is an indigenous plant, which, for a long period of time, has constituted one of the most important branches of agriculture and commerce in Flanders; it is from this country even that it was taken to England, about the year 1524, in the reign of Henry VIII. It was then cultivated with success in the counties of Kent, Essex, and Surrey, and finally extended to the southern and western parts of the kingdom. Within the last century, this culture has obtained so much success, that it is not only sufficient for the supply of England, Scotland and Ireland, but a large amount of hops are exported to foreign countries.

This plant occupies a distinguished place among those most useful to man. The rigors of winter are not felt by it, the stalks have scarcely commenced to grow before the young shoots afford subsistence among the earliest of the season, prepared and eaten as asparagus. These shoots are agreeable to the taste, but leave a light degree of acridity upon the palate; this acridity is due to a principle which I shall indicate directly.

Most persons who eat the young shoots of the hop, are not incommoded by this acridity, yet I am acquainted with one,

who, whenever he partakes of them, is attacked with violent irritation of his throat.

Beside the employment of the young shoots indicated above, the stems, when macerated in water, afford a coarse threading, analogous to that of hemp, and from which excellent cording can be fabricated. It is to be regretted that our cultivators do not seek to employ this part of the plant which they reject as useless, and which might furnish to commerce yet one more product. All animals eat the plant with avidity, and its leaves and suckers, when young and delicate, afford them excellent nourishment.

Finally, every body knows the use which is made of the fruit or cones, (*strobiles,*) in the north of Europe, for flavoring beer and preventing it from becoming sour. Employed for this purpose the hop must necessarily be placed in the first rank of plants—the most cultivated and most interesting. M. Richard informs us, that in England small pillows of its strobiles are placed under the head, in cases of insomnolence. It is rare, says he, that this measure is not productive of calm and restorative sleep. From their narcotic property, they are in addition employed internally in medicine, either in decoction or infusion, but this property is not manifest except in large quantity ; thus many persons experience, after having drank several glasses of beer, an insurmountable desire to sleep. But in the decoction, or infusion, which is prepared from two drachms of the strobiles, this stupifying action is almost inappreciable.

The portion of the plant which has been the principal object of the researches of chemists, is the yellow powder; this is golden, resiniform, aromatic and bitter; it is found upon the woolly foliaceous scales, which constitute the cones at the period of maturity. This powder was first studied by Dr. Ives, of New York, who named it *lupuline.* The researches of MM. Chevalier and Payen have demonstrated (*Journal de Pharmacie,* vol. viii., p. 209,) that this substance is composed of resin, volatile oil, a bitter principle, gum, extractive matter, fatty matter, &c.

MM. Sebailliff and Raspail, the first who have examined this substance with the microscope, have found it composed of globules filled with a yellow matter, and under this view have pointed out its analogy with pollen. From many experiments, the lupuline appears to be the active principle of the fruit of the hop.

So far as I am aware, no chemical researches have been made with the view of determining the principles found in the young shoots; the desire of determining what it is in them which affects the throat, induced me to undertake their analysis; my intention being only to isolate the principles, without endeavoring to determine their quantity, I shall confine myself therefore to merely indicating them.

I took the shoots of the hop, which I washed in cold water in order to free them from the earth which adhered to them, and I allowed them to dry for half an hour; they were then bruised in a marble mortar and placed in a press to extract the juice in the usual way. The juice which flowed from them was clear, slightly yellowish, having a peculiar odor, a sweet taste, slightly sugary; it reddened litmus paper; tested with persulphate of iron it changed to a bluish black. In a few minutes after the juice is procured, it becomes cloudy, a slight fermentation takes place with the formation of froth upon the surface, while a pretty abundant precipitate is formed. I allowed the reaction to continue for twenty-four hours, and finally filtered in order to separate the liquid portion.

A. *Examination of the liquid portion.*

The filtered portion was clear, of a slightly yellowish tint, of the same odor, and taste as before. The same action was exhibited with litmus paper. It was exposed to a temperature of from 70 to 75 during an hour; the albumen which formed was separated by filtration, when the liquid was evaporated by a salt water bath to the syrupy consistence; treated with alcohol, it afforded a gummy and extractive precipitate.—During the evaporation, there was remarked, here and there, a supernatant liquid of a yellowish brown color, of an oily appearance, of a very strong odor, similar to that of rancid white

soap; this fluid was removed carefully for examination. The alcoholic solution was a pale yellow; after twenty-four hours it cleared; it was separated from the precipitate solely by decantation, and submitted to spontaneous evaporation; at the expiration of several days, there were remarked a crowd of small crystals which lined the sides of the capsules; I regarded them in the first instance as crystallized sugar from the sugary principle; during the evaporation gummy matter was also deposited upon the sides of the capsule.

B. *Examination of the matter left on the filter.*

This was allowed to remain some days upon the filter to facilitate the removal of the fluid part; from the gray color, which it presented at the time of precipitation; it passed to a wine-red by exposure to the atmosphere, a coloration due doubtless to a principle which becomes modified by the action of the air, as is observed in some coloring substances; on another occasion I again observed this fact of coloration, but of less intensity. Once having set aside the water which had been boiled with the young shoot of hops, I remarked at the end of twelve or fifteen days, that it had acquired a beautiful rose color, a coloration which I attributed to the influence of the chloride of sodium, which is used in cooking vegetables. The matter which remained upon the filter, partakes in a high degree of the odor of the oily substance already alluded to; its taste is slightly sweetish; it was treated at several repeated times and for several days with alcohol at 0.837; this removed from it the sugary principle and the oily appearance; the part which was not acted upon by alcohol, was without taste and odor; exposed for several days to contact of air, it became hard, and presented the consistence of corneous matter; finally, after prolonged contact, it became blackened and friable; it resisted the action of ether, and was slightly attacked by acetic acid and caustic potassa; heated in a glass tube, it gave out ammoniacal products. From these characteristics, I am induced to consider it as composed in great part of insoluble albumen; I have not determined the presence of amylaceous principle.

C. *Examination of the crystalline matter.*

The crystalline substance which was observed during the evaporation of the alcohol, was still found in a part of the juice which had been freed by heat from all albumen ; this had been concentrated by evaporation and allowed to remain undisturbed several days, when there was formed a crystalline precipitate, which was separated by filtration; the portion filtered had an acid and sweet taste; the acid was separated by the neutral acetate of lead ; I obtained a precipitate, which, when washed and decomposed by a sufficient quantity of sulphuric acid, presented a product which had the characters of malic acid. That which remained upon the filter was washed with a small quantity of water and added to the crystals obtained during the spontaneous evaporation of the alcoholic solution. They were redissolved with a sufficient quantity of water, the solution subjected to slight evaporation, and then allowed to deposit its crystals. They are hard, white, of perfect cleanliness ; their form that of rhomboid, some of them hexagonal prisms ; they are without odor, taste slight; soluble in about sixty times their weight of water; less soluble in alcohol of 0.852 ; reduced to powder and placed upon a piece of litmus paper previously moistened with distilled water, they immediately reddened it ; the aqueous solution treated by a solution of chloride of barium, with neutral acetate of lead and protosulphate of iron, presented nothing remarkable. Heated in a glass tube with a spirit lamp, they soon disengaged a strong ammoniacal odor; reddened litmus paper introduced into this tube soon became blue; they left a carbonaceous residuum, which, when treated with cold nitric acid, gave rise to no appreciable phenomenon.

All the properties which I have detected in this substance, have assured me that it was *asparamide.*

Asparamide has hitherto not been obtained but in a small number of vegetables; in the first instance by MM. Vauquelin and Robiquet, in the sprouts of the asparagus; in 1816 by M. Bacon, Prof. of chemistry at Caen, in the root of the mallows. He regarded it as a combination of malic acid and a

peculiar vegetable alkali to which he gave the name of *altheine;* but Plisson having examined it, recognised it as a principle similar to that derived from asparagus. More recently M. Blondeau, a pharmaceutist of Paris, has detected the presence of the same principle in the root of the large comfrey. Vauquelin has moreover detected it in the potato, and M. Robiquet in the root of the liquorice, where it bears the name of agedoite. Finally, its presence has been determined in the species of ornithogalum.

D. *Examination of the matter of oily appearance.*

The small quantity of this matter obtained from a certain quantity of juice during evaporation, was united to that extracted by alcohol from the precipitate ; it presented itself under the form of a liquid of oily consistence, of a yellowish brown color, having a sweet taste at first, afterwards slightly bitter; active in producing acridity in the throat; in every respect similar to that remaining after eating the young shoots, but more decided; its odor recalls that of rancid soap;—it was treated with hydrated ether, in which it dissolved completely. The solution allowed to evaporate spontaneously left as a residuum—1, a solid substance, of a white appearance, under the form of small grains or lumps ; 2, a brownish oily liquid which covered the solid matter. These two substances being equally soluble in alcohol and ether, it is difficult to isolate them completely, yet the solid part being specifically the heaviest, I had recourse to this property. I poured water upon the residue of the ethereal evaporation and agitated strongly; after a few moments of repose, the solid portion was held in suspension in the water, the largest fragments occupied the bottom; the liquid portion, which was supernatant, was dissolved by ether, which I poured upon the top and removed with a syphon.

E. *Examination of the solid matter.*

This is white, taste sweet, analogous to that of white soap, slightly acrid, which I attribute to the presence of a certain quantity of liquid oily matter; its odor is feeble, it is soluble

in alcohol and ether; the alcoholic solution, when it is much concentrated, allows a deposition under the form of pearly scales; this solution reddened litmus paper, it precipitates the neutral acetate of lead, the nitrate of silver and sulphate of copper. The solid matter exposed to a temperature of 70° or 75° is not liquified, but gives rise to some disengagement of air, and is finally rendered slightly brown.

F. *Examination of the liquid product.*

This liquid has a brownish yellow color, a very penetrating odor, which resembles that of rancid soap; its taste is sweet in the first instance, then a little bitter, and soon produces acridity in the throat; an acridity which has some resemblance to that produced by the oil of the Croton tiglium; it is soluble in alcohol and ether, and reddens litmus paper, previously moistened with distilled water. Exposed to a temperature a little elevated, it becomes volatilized in part, giving off a whitish vapour; the part not volatilized becomes slightly brownish and thickened; litmus paper moistened and plunged into the vapor undergoes no change. Finally, from the whole of the physical properties, this oily matter is similar to the fixed oils: it loses its rancid odor by time. It is to this principle that the young shoots of the hop owe their light degree of acridity.

To judge from the examinations which I made, these two last products appear to be acid in their nature. I regret not having obtained sufficient of them to study them well. While in doubt, I shall content myself with indicating the solid substance by the name of resin, and the liquid substance by that of oil.

From what we have just seen, it will be admitted that the young shoots of the hop possess the following constituents:

1st, Albumen, insoluble; 2d, Albumen, soluble; 3d, Gum, or mucilage; 4th, Sugary matter; 5th, Extractive matter; 6th, Red coloring matter; 7th, Asparamide; 8th, Resinous matter; 9th, Oily matter; 10th, Tannin; 11th, Malic acid; 12th, Malate of lime; 13th, Sulphate of potassa.

ART. XV.—NOTICE OF SEVERAL PREPARATIONS OF IRON.

By M. Beral, Pharmaceutist.

Experiments undertaken for the purpose of rendering more perfect the preparations of iron used in medicine, have led me to the discovery of several ferruginous products, not yet examined, or but little known. I shall make known the more prominent properties of each of these products so as to complete what I have already published on ferruginous compounds in general, and the citrate of iron in particular. I take advantage of this occasion to communicate the formulæ of several medicines, of which the use is becoming extensive, and which have not yet been published in any work.

Sesquicitrate of Iron.

The citrate of the sesquioxide of iron is obtained under the form of transparent plates, of a beautiful garnish hue. This salt, remarkable in every respect, dissolves in water with great facility, forming a permanent solution with but little taste. This preparation forms the base of many pharmaceutical compounds, appropriated to the healing art, and will themselves afford the subject of a future essay.

Citrate of protoxide of Iron.

Citrate of the protoxide of iron is prepared by treating iron filings with citric acid, previously dissolved in distilled water. This salt is white and pulverulent, and but slightly soluble. It is rapidly colored by light, and by the action of moist air its composition is modified, the iron passing to a higher degree of oxidation. This citrate, like the other salts of iron, has a strongly marked chalybeate taste.

Citrate of the Magnetic oxide of Iron.

Combined with magnetic oxide of iron, citric acid furnished an uncrystallizable salt, of a green color, and sus-

ceptible of being formed into transparent tablets. This salt is soluble and very active; but as its taste is decidedly chalybeate, it perhaps cannot be employed internally. It is remarkable that its solution does not alter, but preserves its green color, although exposed to the prolonged action of the atmospheric air.

Citrate of protoxide of iron and quinia.

The citrate of iron and quinia is a new salt, which was needed in disease. This medicine is formed by the combination of four parts of citrate of iron, with one part of citrate of quinia. It is obtained under the form of transparent plates, soluble, very bitter, and of a garnet hue.

It is only in the form of pills that this salt can be used on account of its great bitterness.

Chalybeate wine of quinquina.

Composed of elements which were supposed incompatible, the chalybeate wine of quinquina constitutes a new medicine, the necessity of which is frequently seen, and which, in the hands of physicians, receives numerous useful applications.

Fifty grammes of this wine contains 1 gramme of citrate of iron and the soluble principle of 3 grammes of quinquina: the quantity may be increased at pleasure.

Tannate of the sesquioxide of iron,

Is obtained by adding a decoction of galls to a solution of a sesquisalt of iron. This tannate is blue, insoluble and without taste. Its properties are not very manifest.

Syrup of tannate of iron.

℞—Simple syrup, - - - -	375	parts.
Syrup of vinegar, - - - -	125	"
Citrate of magnetic oxide of iron, -	10	"
Extract of galls, - - - -	4	"

Mixed and made into a syrup.

Many physicians use the tannate of iron under the form of syrup. As the iron in this preparation is in the state of the magnetic

oxide, and united with an acid, it is soluble and susceptible of receiving useful applications.

Syrup of iodide of iron.

℞—Simple syrup,	- - - -	200 grammes.
Liquid iodide of iron,	- -	1 grain.

Each spoonful of this syrup contains 1 grain or 5 centigrammes of dry iodide of iron.

As soon as a solution of iodide of iron is placed in contact with atmospheric air, a part of the iron oxidizes, and a corresponding quantity of the iodine is set free. This circumstance modifies the action of the medicine in a bad manner and injures very much its use.

Water, saturated with sugar, has the property of protecting the iron from oxidation; it is therefore under the form of syrup only that we can employ the iodide of iron.

Saccharate of lime.

℞—Simple syrup,	- - - -	1000 grammes.
Quick lime,	- - - -	10 "
Water,	- - - - -	100 "

Slack the lime with the water, and add the syrup to the mixture, boil for ten minutes and filter through paper, then add to the product four times its weight of simple syrup.

It was Prof. Trousseau who used this remedy. He employed it in chronic diarrhœas and dysentery.

Lactate of iron.

As all pharmaceutists can procure lactate of lime at the price of 20 fr. for 500 grammes, the lactate of iron may be prepared in every laboratory. The following is a simple process and succeeds well.

Dissolve 500 grammes of lactate of lime in 2 killogrammes of boiling water; precipitate the lime by oxalic acid, which forms an insoluble oxalate and filter. The liquid obtained contains lactic acid, which being placed in contact with iron filings and heated for six or eight hours yields, on cooling, very white lactate

of iron in a crystalline powder; it only remains to separate the excess of iron, and to wash with alcohol and dry it.

On treating sesquioxide of iron with lactic acid, I obtained a soluble lactate of a red color, but I have not yet sufficiently examined it to ascertain all its characters.

Journ. de Chim. Med.

ART. XVI.—NOTICE OF THE HACHISCH.

In a work published by Dr. Aubert, he has devoted an article to a particular substance, to which M. Sacy has given the name of *hachisch*, and which is in general use among the Arabs. This substance produces a species of intoxication. Dr. Aubert has examined this vegetable; the following are his observations:

"If we examine the leaves, the flowers, and the fruit of this plant, we will recognise a species of hemp grown on sterile ground. The hachisch is in fact of the same family and the same genus. It is an annual plant which grows in the whole of Lower Egypt, where it is an article of great consumption and commerce. We are assured that it is likewise cultivated in Syria and some parts of Asia Minor. The difference which exists between the hemp and the hachisch is in the stalk; this latter has the height of but two or three feet; its stalk is not simple, but branching even from the base. The branches are alternate, and we do not find on its stalk the same filaments as on the hemp. The odor is less strong than hemp, and is somewhat peculiar. The most common and certain mode of proving its effects is to make a decoction of the plant, then add fresh butter, and leave the whole on the fire until the liquid is totally evaporated; it is then strained. The butter has now acquired a beautiful green color. It is used mixed with sugar, pistachio nuts and other ingredients."

Dr. Aubert states its effects as follows:

"I took it in the form of sugar lozenges of a green color, and having a slightly nauseous taste, but very well disguised by pistachio nuts, and essence of roses and jasmin. The effects were but slightly marked upon myself; not being acquainted with the substance, I was prudent in its use. One of us imagined that he would die of apoplexy during the night, and commenced lecturing us on our mode of living and conducting ourselves. I was much astonished at the gaiety which was produced, and the strange ideas uttered, and those which passed through my brain.

"Some days afterwards I doubled the dose of the sugar containing the hachisch, and laid myself down upon the divan, drinking coffee to develope the effects of this substance. I soon perceived an itching in my feet, and a sensation of compression in my head, which was suddenly dissipated, and my skull seemed empty. I then experienced peculiar sensations; every thing appeared in a new form; the figure of my neighbour seemed the most grotesque imaginable; I burst into laughter at his nose, and continued laughing for near an hour; every thing excited it. During this time the most singular and diversified ideas passed through my brain with astonishing rapidity. I felt in a perfect state of existence without any painful feelings; the past, the present, and the future no longer existed, there was nothing to me but the fleeting moments; it was the most complete *dolce farniente.* Finally, every thing became calm, and the desire of sleep invaded me. The whole night passed in an agreeable revery.

On awakening I possessed an exact remembrance of every thing which had passed; my head did not ache, and I had not the parched mouth, the consequence of intoxication from opium or wine.

"I continued to take this substance with my friends, to study the effects produced upon us.

"The first of these effects is the extreme pleasure which one has to stretch himself upon the divan, to smoke, and to take coffee, with a repugnance to every species of motion. After-

wards the eyes close as if pained by the light; most singular ideas begin to rise; loud laughter and extravagances of words and actions supervene. The Arabs call this last *fantasia*. In the midst of all comes an appetite almost canine, with a repugnance to wine. At table the effects increase, then gradually diminish, and terminate in a sweet sleep and agreeable dreams; there is no headache, no fatigue, no oppression of breathing.

"The effect on the nervous system is pleasant, well characterized in its actions by hunger, extravagance, rapidity of ideas, and a continual combat of self with instinct."

It is desirable that new trials made in France should confirm these curious details given by Dr. Aubert.

Journ. de Pharm.

ART. XVII.—MODIFICATION OF THE PROCESS OF M. GAROT FOR COVERING PILLS By M. Vee.

(*Extract from the Journ. des Connaiss. Med. et Pharm.*)

The process pointed out by M. Garot for covering pills, by dipping them in a solution of gelatine, is sometimes difficult of execution; thus, if the pillular mass is soft, if it contains oils or oleoresins, as copaiba, for example, the gelatin on drying contracts with so much force, that a portion of its contents is inevitably pressed out. This inconvenience may be partly obviated by adding to the gelatine some gum or sugar. The following mixture succeeds perfectly :

℞—Dry gelatine, - - - - - 1 part.
Jujube paste, - - - - - 7 "

Water, a sufficient quantity to dissolve the above, and form a syrupy solution when placed on a salt water bath. This solution is to be used in the same way as that of M. Garot. When we wish to prepare a large bolus, and to enclose oils or liquid resins, it is necessary to dip them a second time, after the space of quarter of an hour.

The mixture which we advise, adds the author, dries almost as promptly as pure gelatine, contracts less, and leaves an agreeable taste which may be varied by the addition of different aromatics. *Journ. de Pharm.*

ART. XVIII.—FORMULÆ OF SEVERAL PREPARATIONS OF CUBEBS, EMPLOYED BY DR. PUCHE AT THE HOSPITAL OF MIDI.

Liquid aqueous extract of cubebs.

Take of powdered cubebs q. s., and form, with one and a half times its weight of boiling water, a soft paste, which is, after several hours contact, to be expressed; the residue is to be subjected to several successive portions of water, and again expressed until a quantity of liquid, equal in weight to the cubebs employed, is obtained. An eighth part of alcohol is then to be added, and the liquid kept in a cool place.

Liquid alcoholic extract of cubebs.

This extract is no other than a tincture of cubebs, prepared in a displacement apparatus, by means of powdered cubebs and alcohol of 22°, in quantity sufficient to yield an amount of liquid equal to the weight of the cubebs employed.

Syrup of the alcoholic extract of cubebs.

Simple syrup, and liquid alcoholic extract of cubebs, are to be mixed in equal parts, and evaporated, at first in an alembic on a salt water bath, then in an open vessel, until the syrup is reduced to its former weight.

Bolus of cubebs—Bolus of cubebs, copaiba and turpentine.

Dr. Puche often prepares oval boluses of cubebs, each containing a gramme of powdered cubebs, and others of the same weight, composed of equal parts of copaiba, spirits of turpentine and powdered cubebs. All are covered with the gelatinous mixture recommended by M. Vée. *Journ. de Pharm.*

MINUTES OF THE PHILADELPHIA COLLEGE OF PHARMACY.

A SPECIAL meeting of the Philadelphia College of Pharmacy was held Eleventh mo. (Nov.) 6th, 1840.

A quorum being present, the Vice President called for the object for which the meeting was convened. Whereupon, WM. R. FISHER stated it to be, to receive the report of the "Committee of Revision," appointed in March last, to revise the United States Pharmacopœia.

The report was then read and adopted, and the Treasurer was directed to pay the amount of the expenses incurred by the Committee.

A vote of thanks was tendered to the Committe, and unanimously agreed to, and the Vice President was directed to prepare the same and produce it at a future meeting of the College.

A copy of the report is in the hands of the Publishing Committee.* On motion adjourned.

C. ELLIS, Secretary.

Stated meeting, held Third mo., (March,) 29th, 1841.

HENRY TROTH, Vice President, in the Chair.

The minutes of the former meetings were read and approved. The minutes of the Board of Trustees were read, from which the College is informed that PAUL G. OLIVER, J. C. De LACOUR, and CHARLES M. WILSTACH, are recommended to be associated with us in membership, and not being eligible by the Board, they were ballotted for and declared to be duly elected resident members of this College.

The resignations of ABRAHAM KUNZI, JOHN FARR, and CALEB E. PLEASANTS, were accepted.

The Publishing Committee made a verbal report, stating the usual prosperous condition of the American Journal of

* This Report will be presented to the public as soon as the Pharmacopœia has been completed by the Committee of the Convention.

Pharmacy, the publication of which was entrusted to their care.

This being the annual meeting for the election of Officers, Trustees, &c., the following gentlemen were declared to be duly elected, viz. :

President—Daniel B. Smith.
1st Vice President—Henry Troth.
2d Vice President—Dr. Geo. B. Wood.
Secretary—Charles Ellis.
Treasurer—Samuel F. Troth.
Corresponding Secretary—Elias Durand.

Trustees.

Dr. F. Bache,	Warder Morris,
Wm. W. Moore,	Dr. Joseph Carson,
Augustine Duhamel,	Edward Roberts,
Clement Cresson,	Joseph C. Turnpenny,
Peter Lehman,	Dillwyn Parrish,
Dr. R. Bridges,	Thomas H. Powers,
Ambrose Smith,	William Procter, Jr.
Henry W. Worthington.	Jacob Bigonet.
(Elected for 6 months.)	(Elected for 12 months.)

Publishing Committee.

Dr. Joseph Carson,	Elias Durand,
Charles Ellis,	Ambrose Smith,
Dr. R. Bridges,	Augustine Duhamel,
William Procter, Jr.	William R. Fisher.
Dr. Geo. B. Wood,	Dr. Bache.

On motion adjourned.

Charles Ellis, *Secretary.*

MISCELLANY.

Upon the Therapeutic action of Compressed Air. By M. Tabarie. Extracted from a letter addressed to M. Arago. Translated by A. D. Chaloner, M. D.—Some time past M. Tabarié pointed out the resources which the methodical application of compressed air offers to medicine in the treatment of certain diseases, and especially in those which concern the organs of respiration. He now confirms his first observations, and makes known the results of the new investigations he has undertaken, always limiting himself to speak of the influence which the augmentation of pressure exercises upon all the constitution (bodily.) This influence appears to him to be characterised by two principal circumstances.

First—Condensed air reacts upon the circulation, by abating it, and at the same time that it diminishes the number of the pulsations of the heart, it regulates the *rythm* of them. These phenomena, which are scarcely perceptible in a normal state of health, become very obvious in cases of inflammatory or febrile diseases, when otherwise, the experimental conditions are fully answered, and sufficiently sustained.

Secondly—Condensed air does not influence the general temperature, as one richer in oxygen would do, for far from exalting this function, (as some have by analogy imagined,) it moderates, and, in certain cases, it even weakens it. Not only does the *balneum* of compressed air, really develope no unusual heat in the interior of the thorax, but on the contrary it tends to produce a general sensation of coldness, even when the temperature of the *preparation* is superior to that without; sometimes this sensation even increases with the duration, and the elevation of the degree of the *balneum*. The author attributes to this fact that the workmen who remain a long time, and at great pressure, under a diving bell, are compelled to leave on account of the coldness, which is not consistent with the temperature which surrounds them. In conclusion, he insists upon the necessity of exercising the compression in a gradual, uniform, and sustained manner, experience having shown him that sudden transitions accelerate and disturb the circulation of the blood, instead of moderating it, and increase in place of arresting the hæmorrhage.

Action of Sulphurous Acid on Hyponitrous Acid—Crystals in the Chambers of Lead—Theory of the formation of Sulphuric Acid. By M. F. DE LA PROVOSTAYE. Translated by same.—Notwithstanding the repeated attempts of chemists to determine the nature of the crystals in the chambers of lead, their composition is yet uncertain; some look upon them as a combination of nitrous and sulphuric acid and water; whilst M. Dumas, guided by numerous analogies, supposes that for their existence there is a direct combination of sulphuric and hyponitrous acids. M. de la Provostaye undertook to decide this important question; he has observed that sulphuric and hyponitrous acids (which have only now been made to react upon each other) combine together in producing a new compound, the more interesting, since it throws great light upon the crystals of the leaden chambers, and upon the theory of the formation of sulphuric acid.

This new substance dissolves in all proportions in hydrated sulphuric acid, and gives in very extended limits, crystallizable combinations. The crystals of the chambers of lead, which had been hitherto looked upon as identical, are really nothing but mixtures, in variable proportions, of this substance with anhydr and hydrated sulphuric acid, which explains the difference of the results of their analyses. Finally, the author admits that these crystals are never formed but under the influence of *anhydrous* or hydrated sulphuric acid; and that water, when it is free, always tends to decompose them.

New Method of Analysing Sulphurous Waters, and the re-action of Iodine with Sulphydric Acid—The Sulphydromètre. By M. ALPHONSE DUPASQUIER, Professor of Chemistry at Lyons. Extracted from the Annals of Chemistry and Physic. By A. D. CHALONER, M. D.—Having undertaken to write a full account of the fine institution which has been founded near the Allevard Spring, (Isère,) in the midst of the magnificent landscapes of the valley of Graisivandan, M. Dupasquier has occupied himself, carefully, with the analysis of the sulphurous waters which these springs abundantly supply. He has studied it thoroughly, and his investigations have led him to the discovery of a process as simple as curious; to recognise and prescribe the *exact* quantity of *free* or *combined* sulphydric acid in mineral waters. The tincture of iodine being poured into a fluid mixed with sulphydric acid, decomposes this acid entirely, and so instantaneously that it is very easy to ascertain the point where its decomposition is finished, and where the *iodine* combines no longer. Consequently, from this observation, which is peculiar to him, M. Dupasquier thought that in making use of a *Tincture of Iodine*, carefully prepared, he could from the quantity of Iodine employed to saturate a *litre* of sulphurous water, subtract the proportion of sulphydric acid, either free or combined, which it contains. This foreknowledge was confirmed by experience,

and the author has made his new method of analysis very convenient by means of an instrument which he has named the *sulphydromètre*. This instrument is a graduated tube, filled with the tincture of iodine, one of the ends is closed with a stopper, while the other is slender, and terminates by a capillary orifice, which permits the tincture of iodine to escape in drops from the time that the stopper is removed. To use the *sulphydromètre*, pour into a porcelain capsule a fixed quantity of sulphurous water to be analysed, add a few drops of the solution of very clear starch, then add the tincture of iodine gradually, taking care to assist the reaction by stirring the mixture with a glass rod. As long as any traces of the sulphydric acid remain, the iodine will carry off the hydrogen, by precipitating the sulphur, and disappear immediately without colouring the starch, but as soon as the saturation is completed the least trace of the *free* iodine is sufficient to give a beautiful blue colour to the solution.

Then count how many degrees the tincture has disappeared in the *sulphydromètre*—of which each degree is equal to *one centigramme* of iodine, and each tenth of a degree, one *milligramme*. The quantity of iodine requisite to saturate a *litre* full of sulphurous water, being given, it is very easy to find how much *sulphydric acid* this *litre* of water contained, by determining the equivalent of the iodine in hydrogen. The volume of this hydrogen being known, we have that of the sulphydric acid, which is exactly the same. To render the use of this instrument more convenient, the author has made a table which indicates in weight and in volume the quantity of sulphydric acid, represented by 1, 2, 3, &c. 100 *centigrammes*, 1, 2, 3, &c. 100 *milligrammes*.

This method of analysis, independently of giving results of a rigorous exactitude, has the advantage of being so quickly performed that fifteen or twenty experiments can be made in less than an hour. It is also so extremely simple, that it does not require a chemist to determine the proportion of sulphydric acid contained in a mineral water; any intelligent person can each day observe the precise variations in the strength of the sulphurous waters, either by atmospheric influence or the mixture of water. Among other advantages this method possesses, M. Dupasquier shows its sensibility, which is so great that it indicates the precise quantities of sulphydric acid in those waters upon which other reagents produce no effect, while they evidently show a sulphurous character. The tincture of iodine really can (he assures us) disclose in a decided manner a *drop* of a concentrated solution of an *alkaline sulphydrate*, poured into a *hecto litre* of water, while the known reagents become powerless if they are merely poured into ten *litres* of water.

Preparation and Employment of the Sesqui-Iodure of Iron.—M. Oberdoerffer, a pharmaceutist of Hamburgh, gives the following formula for

the preparation of this salt, which he says may be preserved a long time without decomposing:—Mix in a glass vessel half an ounce of iodine, a drachm and a half of iron filings and an ounce of water; when the reaction is completed, the mixture is to be slightly shaken until it becomes of a clear green color, due to the ioduret of iron. Then dilute it with four ounces of water, filter and also pass some water through the filter. Afterwards add to the solution two drachms of iodine, which is readily and quickly dissolved. A deep reddish brown liquid results, to which a sufficient quantity of water is added to make the weight of the whole ten ounces. Each drachm contains about four grains and a half of iodine. This preparation has been long employed at the General Hospital, Hamburgh; its effects are the same as those of the ioduret of iron; it must be given internally, however, in smaller doses. The best form for its administration is in syrup.—*Zeitschrift für die gesammte Medicin*, June, 1840.

In our number for February last, (p. 449,) we gave a formula for a syrup of ioduret of iron, which, from considerable experience, we can recommend as a most valuable preparation. It can be preserved for a long time without becoming decomposed, and produces the best effects of the two articles which enter into its composition. The comparative value of this and the sesqui-ioduret must be decided by future experience.—*Am. Journ. Med. Sciences.*

Socotrine Aloes.—"This plant (the aloe) has rendered Socotra famous from the earliest period. It is found growing on the sides and summits of the limestone mountains, at an elevation of from 500 to 3000 feet above the level of the plains. The plant appears to thrive only in parched and barren places; its leaves are plucked at any period, and, after being placed in a skin, the juice is suffered to exude from them. This is afterwards carried principally to Muscat, where the price varies according to the quality, from two to four shillings the English pound. Socotrine aloes, if care were taken in collecting them, would be the finest in the world; but this is not the case, and their value becomes proportionably deteriorated.

"When the authority of the sultans of Kisseen was better acknowledged than at present, they monopolized the whole produce of the island; and stone walls, dividing its surface into separate portions, were carried with immense labor over hill and dale. These still remain, but now any one collects the plant, when or where he thinks proper, and this they only care to do when the arrival of a ship or buggalo creates a demand. Every part of the island affords this useful plant, but more especially the western, where the surface is thickly covered for miles. In 1833, only two tons were exported."—*Ibid. from Wellsted's Tour on the Island of Socotra.*

Dragon's Blood.—"The trees of this are not usually met with at a less elevation than 800 feet, and they frequently occur as high as 3000 feet above the level of the sea. The trunk, at the height of six feet from the

ground, varies from twelve to eighteen inches in diameter, and its height is from ten to twenty feet. The gum exudes spontaneously from the tree, and it does not appear usual on any occasion to make incisions in order to procure it. Two kinds were shown me; one of a dark crimson color, called *moselle*, is esteemed the best, and its price at Muscat is from six to eight rupees, the Bengal seers. I was frequently assured, that not one-tenth of the quantity which might be procured was ever collected by the Bedowins. As with the aloes, this appears to be consequent on there being no regular demand."—*Ibid.* T. R. B.

Ointment for Itch.—Dr. De la Harpe, chief physician of the Hospital of Lausanne, gives in the *Gazette Medicale de Paris* (July, 1840,) the following formula for an ointment which he says he has very successfully employed in the treatment of upwards of 400 patients. Flowers of sulphur 16 parts, sulphate of zinc 2 parts, powder of white hellebore 4 parts, soft soap 31 parts, lard 62 parts.

The mean duration of treatment with this ointment was in 1836 eighteen, in 1837 fifteen, in 1838 eleven, and in 1839 ten days.—*Am. Journ. of Med. Scien.*

New Theory of the Galvanisation of Metals. By W. Schœnbein.—Iron, zinc, and copper, are oxidized in the air, in water, and in saline solutions, as well as when they are in contact with other metals, or attached to the poles of a galvanic pile, as when they are isolated. But if a current is established, however feeble, the metals which form or are connected with the negative pole which receives the hydrogen are not attached. It follows from this, that the protection of copper by iron, as in the experiments of Davy, is due to a chemical decomposition of the water which occurs, however feeble the chemical action. It results from my experiments:

1st. That neither ordinary or voltaic electricity are capable of modifying the chemical properties of bodies, and consequently that the electrochemical theory of Davy and of Berzelius cannot be admitted.

2nd. That the modifications which occur in the chemical properties of certain bodies when they are under the influence of contact, are due to the production of some substance, and its deposition on these bodies by the action of the electric current.

3d. That the surest manner of protecting certain oxidizable metals from the action of free oxygen dissolved in water, is to place them in a voltaic current composed of the metal in question and one that is more oxidizable, both being in an *electrolytique* liquid, such as water which contains hydrogen.

Combinations of Ammonia with Metallic Oxides.—A series of these compounds has been described by M. O. Rammelsberg in the Ann. de Pog. t.

48. By dissolving Iodide of Zinc in a solution Ammonia and allowing the mixture to evaporate spontaneously, brilliant prismatic crystals were obtained, which were permanent in the air, but rapidly decomposed when treated with cold water. The formula of this combination is ZnI^2+4NH^3.

When dry Iodide of Zinc was treated with gaseous Ammonia, a combination is obtained which contains a large proportion of Ammonia. Its formula is ZnI^2+6NH^3. It is also rapidly decomposed by water.

Iodide of Cadmium, by similar treatment with Ammonia, produces compounds of which the formula are CaI^2+2NH^3 and CaI^2+6NH^3.

Compounds may be formed with Iodide of Cobalt and Ammonia, which consist of CoI^2+4NH^3 and CoI^3+6NH^3.

When Ammonia is added to a solution of Iodide of Nickel, a blue precipitate is formed which entirely dissolves on warming the liquor, from which, on cooling, it crystallizes in small crystals. These consist of NiI^2+6NH^3.

A compound may also be obtained of the Biodide of Copper and Ammomonia. *Ann. des Mines.*

Researches on the Composition of Crystallized Phosphoric Acid. By M. Peligot.—Having kept for some time phosphoric acid of a syrupy consistence in stopped bottles, it formed two beds of crystals; the superior, transparent and hard; the inferior, of the consistence of candied honey. On analysing them separately, after drying, I found 0.27 to 0.28 water in the former, and 0.22 to 0.23 on the second; the hydrate with three equivalents should contain 0.274, and with two equivalents 0.201. It is known that glacial phosphoric acid contains only one equivalent. The supposition of M. Graham on the existence of two hydrates is thus confirmed.

Double Nitrate of Potassa and Soda. By M. Loole.—By dissolving with heat equal parts of the nitrates of potassa and soda, in three parts of water, and cooling the liquor gradually, crystals of the double salt were formed half an inch long, in radiated groups, and having a silky lustre.

Protection of Iron by Zinc. By M. Munckel.—M. de Althaus, director of the salt works of Durheim, has succeeded in completely protecting the pans, thirty feet long, which are used for evaporating brine, by riveting to their exterior bands of zinc; and he has remarked that it was not necessary that the metals should be polished at the points of contact. This fact, which is established by an experience of more than ten years, tends to support the theory of contact. *Ann. des Mines.*

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*Mr. Donovan on Cod-Oil.**—It appears that cod-oil has been a good deal used, of late, in France and Germany, in certain scrofulous cases. They

* Dublin Journal, July 1, 1840.

say that when properly administered, cod-oil cures scrofula of the bones, marasmus, and chronic arthritis of a scrofulous or rheumatic form. Caries, accompanied by a sore and swelling of the soft parts, requires the treatment with oil to be seconded by local applications, such as compression, and iodurettted alcoholic fomentations; cod-oil is of no avail against gouty arthritis, or swelling of any lymphatic glands but those of the abdominal cavity; its action seems doubtful or null in scrofulous phthisis when at all advanced. To produce advantageous results, in any disease, the use of cod-oil must be persevered in for several months, in doses of three or four table-spoonsful daily.

Now, if this be all true, cod-oil is no bad thing, and it would be well to have it as good as can be got. Perhaps it should *not* taste exactly like train-oil, as that might make one sick, if it did nothing else. So Mr. Donovan has perfected the process for its preparation, and made cod-oil a very respectable oil to take.

Take, says he, any quantity of livers of cod, throw them into a very clean iron pot, and place it on a slow fire, stir them continually until they break down into a kind of pulp: water and oil will have separated. When a thermometer plunged in the pulp will have risen to 192°, the pot should be taken from the fire, its contents transferred to a canvass bag, and a vessel placed underneath. Oil and some water will run through. After twenty-four hours, separate the former by decantation, and filter it through paper.

The oil, thus prepared, is of a pale yellow colour; its smell is weak, and resembles that of a cod boiled for the table when in excellent condition. Its taste is bland, by no means disagreeable, and, as might be expected, is totally free from rancidity. It is very liquid. Its specific gravity in my trials was 0.934, although in all the published tables of specific gravities it is stated to be 0.923. In cold weather it deposits much stearine, and this ought not to be separated.

The product of pure oil is very variable. He has obtained so much as a gallon (wine measure) from twenty-eight pounds of livers, the produce of fifty cods. Sometimes the livers will afford much less. The runnings of the first heat only should be used: a second heat will supply more oil, but it will be comparatively strong-smelling, ill-tasted, and deep-coloured. The above estimate is true only when the fish is in the best season, and fully grown. Towards the close of the season the produce will be less. The livers of some cods are flaccid and lie flat without plumpness on a plane surface. These afford a deficient quantity of oil, a brown, strong-smelling quality, and a large portion of brown water; they are totally unfit for use, and their oil is disgusting. The livers are often found diseased and dark-coloured; such afford a very bad oil, and are of course to be rejected.

On the west coast of Ireland they consider the beginning of the year the best season, and on the east the month of November for the cod-livers. Thus, concludes Mr. Donovan, in preparing cod-oil fit for medical purposes, three chief things are to be attended to: the livers must be perfectly healthy; they must be as fresh as possible, the least putrescency being injurious; and the heat at which the extrusion of the oil is effected must not exceed 192°. *Med. Examiner.*

On Artificial Nipples of Ivory.—The following remarks are from a report of Messrs. Dubois, Capuron, and Villeneuve—three of the most distinguished accoucheurs of Paris—on the artificial nipples recently invented by M. Charriere, an ingenious cutler of the metropolis.

"In the construction of these nipples he uses ivory, which has already been made soft and flexible by a process that has been long known: they are more solid and more durable than those hitherto employed. They are sufficiently resisting not to be flattened by the lips of the infant, and yet not too hard to fret and inconvenience them. They are easily kept clean by merely shaking them about in water, and with this simple precaution it will be found that they are not apt to communicate any unpleasant smell or taste to the milk. Besides, they can be readily attached to any sort of sucking dish or bottle, if the child is brought up by the hand and not suckled by the mother.

To preserve the flexibility of the prepared ivory, all that is necessary is to keep it from the contact of the air by placing the nipple under a glass, or by wrapping it round with a damp cloth. In fact we (the reporters) think highly of these new contrivances, and already, we are told, they are extensively used both in public establishments and in private practice."

(We have observed in some of the recent French journals, that the prepared flexible-made ivory has been manufactured into bougies for the male urethra; but whether they possess any peculiar advantages we do not know.

Excellent artificial nipples are now made with prepared caoutchouc: they are entirely destitute of any unpleasant smell or taste, and have quite a fleshy feel to the lips when sucked with.)

Med. Examiner, from Med. Chirurg. Review.